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FEDERATION OF MALAYA

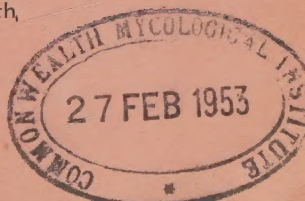
Report
of the
DEPARTMENT OF AGRICULTURE
for the years
1950 AND 1951

BY
O. J. VOELCKER, C.B.E.,
Director of Agriculture, Federation of Malaya

KUALA LUMPUR:
Printed at the Government Press By G. A. Smith,
Atg. Government Printer.

1953

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REPORT OF THE DEPARTMENT OF AGRICULTURE, FEDERATION OF MALAYA, FOR THE YEARS 1950 AND 1951.

SECTION I.

POLICY.

The Department of Agriculture in the Federation of Malaya is the technical organisation through which the Government's agricultural policy is implemented. The Department is not primarily responsible for initiating policy nor do its activities enter the realms of commercial farming. What the Department does do is to evolve, in the terms of practical farming, methods by which effect can be given to Government's policy and to advise and assist the farming community accordingly.

2. The Government of the Federation of Malaya's agricultural policy may briefly be stated as follows:

To increase the agricultural production of the Federation while at the same time maintaining soil fertility.

To diversify the agricultural economy of the Federation.

To intensify agricultural production so that each cultivated acre supports larger yields of crops or livestock.

To increase the production of foodcrops with particular emphasis on rice.

Close co-operation by the Department of Agriculture with other technical departments, particularly those of Drainage and Irrigation, Veterinary, Fisheries and Forestry, is, of course, essential. These departments fall within the portfolio of the Member for Agriculture and Forestry and close co-ordination is therefore assured.

3. The theme of this policy is increased production. To obtain this, two sets of factors are involved: one set is determined by the degree of technical efficiency of farming, the other by prevailing social and economic conditions. The impingement of the one set upon the other is always present—very much so during the present period of communist strife within Malaya and of great market fluctuations—but in the long run the biggest gains in production will arise from improved technical efficiency. It is to this end that the Department of Agriculture functions.

4. Much consideration has been given during the period covered by this report to the part that the Department should play in each of the three phases of Malaya's agricultural industry—production, primary processing and marketing. With the exception of fruits and vegetables nearly all Malayan crops require some form of primary processing before the consumer or exporter will purchase. Efficient primary processing involves the use of some form of machinery and buildings—capital commitments which the small farmer is unwilling or unable to shoulder. He has too little, if any, say in determining the price at which he sells his farm produce, the marketing of which is in the hands

of middlemen. It is, therefore, of limited use to concentrate on increased production and to disregard primary processing and marketing.

5. It is not surprising, therefore, to find that Departments of Agriculture in other tropical territories of the Commonwealth have often become involved in playing an executive role in the marketing of produce, inspection and grading, farmers' co-operative movements, and in some instances in the direct control of primary processing plants. There are two very good reasons why the Malayan Department of Agriculture should not adopt the policy of these other territories. In the first place the Department is geared solely to the improvement of farming; the limited staff, both senior and junior, are highly trained and qualified for this one objective. To employ this staff as executives in primary processing or marketing schemes would be to use the wrong tools for the job. The second reason lies in the recent establishment of the Rural and Industrial Development Authority. This authority is ideally designed to take over at the stage where the functions of the Department of Agriculture cease.

THE RURAL AND INDUSTRIAL DEVELOPMENT AUTHORITY.

6. In proposing the establishment of R.I.D.A., the late High Commissioner, Sir Henry Gurney, expressed the hope that the organisation would, among other functions, enable the small primary producer to receive a fair reward for his labour. The incentive to increased production is greatly lessened if the small farmer sees the profits therefrom finding their way into the hands of middlemen, landlords and those who undertake primary processing. This is particularly true when an endeavour is made to introduce a new crop to smallholders. Middlemen, to cover the risk associated with a product about which they know little, offer a price which has scant relation to the true value of the product. The farmer is discouraged and his new venture is strangled at birth. The records of the Department of Agriculture show many instances of new crops which, though within the capabilities of the small farmers to grow, have not taken on because no Department has been in existence to provide the capital and the organisation necessary for primary processing and marketing.

7. The potential activities of R.I.D.A. in connection with the peasant agriculture of Malaya cover an even wider field than those of processing and marketing. They cover the provision of capital and executive ability to enable the use of new techniques necessary for increased production. For example, tractor cultivation has been shown by the Department of Agriculture to be an undoubted aid in farming; but until tractor cultivation is made available to the small farmer the Department of Agriculture's investigations on mechanisation will remain academic. It is here that R.I.D.A. steps in by providing the capital for the purchase of tractors and the executive organisation for mechanically cultivating the smallholders' farms. This is one example of many activities in which R.I.D.A. can develop and exploit the basic information obtained from the Department of Agriculture's investigations.

8. It is difficult to demark clearly the line between the extension services of the Department of Agriculture and the development services of R.I.D.A. But the general principle is now accepted that where any activity calls for the provision of capital or where highly qualified agricultural technical staff are not required then R.I.D.A. should operate. The Department of Agriculture becomes free to concentrate on what may be termed strictly agricultural problems—the maintenance of soil fertility, the production and distribution of improved planting material and small livestock, the introduction of new crops and the evolution of better farming methods.

THE DEVELOPMENT PLAN 1950-1955.

9. Government's agricultural policy finds expression in the Development Plan of the Federation. Those aspects of the Plan which concern the Department of Agriculture cover two main spheres of activity; the first concerns specific schemes of development, e.g., the provision of approved rubber planting material for smallholders, investigations into the mechanical cultivation of rice, the creation of an isolation nursery for the introduction from other countries of crops new to Malaya, the development of the pineapple industry, the extension of the College of Agriculture; the second sphere involves expansion of research and investigation to enable the Department efficiently to cope with all agricultural problems pertinent to Malaya.

10. Most of the specific schemes were already in operation when the Development Plan was propounded. The cost of these is being borne by Colonial Development and Welfare funds, allocations from which are nearing exhaustion.

11. For the long term agricultural development of Malaya, something much more fundamental is required than a series of isolated schemes. What is required is an adequately staffed and efficient organisation which can not only solve the problems which beset agriculture in Malaya but which can ensure that the solutions are readily available to the farming community. Provision has therefore been made in the Plan for increases both to the establishment of the Department and to the facilities for research, investigation and extension.

12. Out of the many and various ways in which agricultural research can lead to better agricultural productivity, plant breeding and the knowledge of soils and their treatment offer very wide scope. It is, therefore, the policy of the Department to pay particular attention to these two subjects. Under the Development Plan provision has been made for new experiment stations so sited as to be representative of the main soil types and climatic zones of Malaya. To bring home to the farming community the results of experiments on these Stations it will be necessary to expand the extension services of the Department but this expansion will of course follow and not precede expansion of research and investigation.

THE EMERGENCY.

13. The resettlement of squatters had a marked impact on the production of pigs, vegetables, and certain crops grown on a minor scale, but nevertheless important as a step towards the

diversification of Malaya's agricultural economy. Although a high proportion of squatters were in paid employment—made even more attractive by the scarcity of labour—many were dependent on cultivating land for themselves and most took some part in growing vegetables.

14. A major problem in resettlement has been to match the need for security in the new villages with that for adequate farm land. The basic policy of resettlement has been to give protection to squatters who had become established in isolated or indefensible areas; but removal from these areas into the new villages has meant that their cultivated plots—if at any distance from the new villages—have been thrown out of production.

15. There can be no agricultural policy for new villages unless agricultural land is available within reasonable distance. Ideally, families wholly dependent on farming could utilize up to three acres while those in paid employment could cultivate up to half an acre. Unfortunately it has not always been possible to provide this extent of land around many of the new villages. Agricultural policy is directed to the production of vegetables, pigs, poultry and foodstuffs with the object both of increasing the food supplies of the Federation and of creating stability among the settlers.

16. The Department of Agriculture's role in implementing this policy is essentially advisory to the administrative authorities of these new villages, and the role is therefore the same as that afforded to the Rural and Industrial Development Authority.

17. Towards the end of the period under review in this report the Federal Government made substantial funds available to the Member for Agriculture and Forestry in order to assist in the rapid development of agriculture associated with these new villages. These funds are employed by State and Settlement Governments, on the advice of their Agricultural Officers, for such purposes as breaking in new land with tractors, construction of pigsties, provision of livestock, and fencing against wild pig. Where the benefit is to the new village as a whole an outright grant is made, but where the benefit is to an individual villager money is loaned against repayment.

STAFF.

18. In subsequent sections of this report attention will be drawn to the limitations set on the activities of the Department of Agriculture through shortage of staff—particularly of professional officers—which has become increasingly acute. It has been necessary to reduce the attention paid to some lines of work and to abandon altogether or to postpone other lines of work in order that the immediate and most essential problems can be tackled. The strain imposed under these conditions has been magnified by the threat of ambush. It is therefore with pride that the Director acknowledges the keenness and steadfastness displayed by the staff of the Department.

SECTION II.

AGRICULTURE IN THE FEDERATION OF MALAYA.

A.—WEATHER.

19. Weather conditions as they affected agriculture in the 1950-1951 season were generally favourable; there were no reports of floods or drought of any consequence. In the latter part of 1951, however, the weather was erratic in nearly all parts of the Federation. In Kedah and Kelantan the monsoon was late, and in Kedah it was also broken, with intermittent floods and dry spells. In the south and on the west coast the pattern was more normal, but the year's rainfall was above average, with unusually heavy rains at the end of the year.

B.—CROP REPORTS.

(i) RUBBER.

20. Comparative acreages under rubber in the Federation are as follows:

PLANTED ACREAGES.

Year.	Estates. Acres.	Smallholdings. Acres.	Total. Acres.
1947 ..	1,934,106	1,383,193	3,317,299
1948 ..	1,952,347	1,410,178	3,362,525
1949 ..	1,970,579	1,393,881	3,364,460
1950 ..	1,964,370	1,393,881	3,358,251
1951* ..	1,951,020	1,409,808	3,360,828

The acreage figure for smallholdings is provisional; owing to the Emergency some Land Offices have not been able to re-check their acreages and last year's figures have been used for some districts.

21. Production figures are given in the following table:

PRODUCTION (IN TONS).

Year.	Estates.	Smallholdings.	Total.
1947 ..	359,865	285,364	645,229
1948 ..	402,907	294,071	696,978
1949 ..	400,009	270,248	670,257
1950 ..	375,853	316,732	692,585
1951 ..	327,956	275,924	603,880

22. Pan-Malayan imports and exports of rubber during the same periods were:

PAN-MALAYAN IMPORTS AND EXPORTS (IN TONS).

Year.	Gross Exports.	Gross Imports.	Net Exports.
1947 ..	953,303	313,699	639,604
1948 ..	979,115	300,471	678,644
1949 ..	899,212	220,141	679,071
1950 ..	1,106,500	448,655	657,845
1951 ..	1,155,277	547,107	608,170

23. Peak production was the aim of both estates and smallholders, but whereas the former were careful to husband bark resources, this could not be said of the smallholders generally. The production figures show that there was a sharp increase in smallholding production in the first year (1950) of

* Figures are provisional.

higher prices, but in 1951 there was a fall in production of 40,000 tons. This is partly due to the Emergency and the non-tapping of remote areas, but over-tapping of trees already declining in production through old age must be assumed to account for much of the fall in production.

24. Smallholders are still reluctant to face their problem of replanting and this attitude is likely to continue so long as high prices are maintained. It is estimated that only 3,778 acres of old rubber were replanted by smallholders during the year, a very small figure when it is accepted that the major part of the entire acreage of smallholding rubber is overdue for replanting.

25. The importance and the magnitude of this problem is fully appreciated. A Committee was set up in 1949 to advise on ways and means to assist smallholders to replant; it has completed its deliberations, and its final report will be ready early in 1952.

26. There is a keen demand throughout the Federation for new land on which to plant rubber. This is the solution to the economic problem which most commends itself to the smallholder. But there are serious long term dangers both to the smallholders themselves and to the Federation as a whole in the unqualified acceptance of this solution. In the first place the substitution of old rubber land by planting on new land is neither more nor less than the adoption of shifting cultivation, the perils of which are all too prevalent in the tropics. In the second place the smallholder who increases his total acreage under rubber by new planting is further shackling his economy to a crop the future of which is by no means certain.

27. In some States and in both Settlements there is, moreover, a shortage of new land suitable for rubber, and in these territories replanting is the only solution to the problem of rehabilitating the smallholding rubber industry.

28. Under the Colonial Development and Welfare Act, Scheme No. 1176 provides improved planting material for both new plantings and replantings at subsidised rates. Budwood nurseries are maintained on a scale sufficient to supply all likely requirements, but unfortunately the smallholders show a very strong preference for clonal seedling stumps. Available supplies of clonal seed are, however, inadequate and in consequence the production of clonal seedling stumps has fallen far short of demand. An encouraging innovation has been the establishment of *kampong* clonal seed nurseries in many areas. Germinated seed is supplied under Scheme No. 1176, but the *kampong* people themselves provide the land for the nurseries and tend the seedlings under the overall supervision of the Rubber Research Institute and the Department of Agriculture. Some of these nurseries have not been well cared for but in general this example of self help on the part of the smallholders gives promise and deserves every encouragement.

29. The smallholders' interest in latex collection schemes has been maintained, and there have been new developments during the period under review. Many of these schemes depend upon the market for latex and consequently upon the co-operation of commercial concerns. There have been instances where buying has been restricted due to changes in marketing

policy. Valuable experience is being gained in the problems of collection and processing, and this experience is of first importance in formulating schemes to be sponsored by the Rural and Industrial Development Authority.

(ii) RICE.

30. Following the favourable season and record crop of 1949-50, the 1950-51 season was also favourable and a new record in production was achieved. This new record was attained on a reduced acreage of 875,390 compared with 930,530 acres for the previous season. In nearly all States there was a slight decline in the planted area, due partly to the abandonment of remote *sawahs* but mainly because of the greater attraction of rubber tapping. The decline in acreage cannot be regarded lightly but the cultivated acreage should increase again if the price of rubber falls.

31. The following table gives comparative figures for acreages under wet and dry padi together with yields since the 1946-47 season:

Season.	WET PADI.		DRY PADI.		TOTAL.	
	Acreage. (Planted).	Yield. (In Tons).	Acreage. (Planted).	Yield. (In Tons).	Acreage. (Planted).	Yield. (In Tons).
1946-47	732,620	405,940	80,930	22,240	813,550	428,180
1947-48	802,730	520,808	82,760	23,807	885,490	544,615
1948-49	842,450	467,825	65,620	19,833	908,070	487,658
1949-50	871,470	667,485	59,060	24,425	930,530	691,910
1950-51	828,590	684,668	46,800	18,255	875,390	702,923

32. The figures for the Pan-Malayan production of rice in relation to consumption and retained imports for the past five years are as follows:

	1947.	1948.	1949.	1950.	1951.
Retained imports (tons)	237,866	449,739	495,029	435,958	498,929
Production (tons)	257,164	343,065	307,180	435,840	442,780
Consumption (tons)	495,030	792,804	802,209	871,798	941,709
Percentage of production to consumption	52	43	38	50	47

33. The production and consumption figures of recent years show that Malaya can produce about half of its total consumption needs; home production is sufficient for about $\frac{1}{2}$ lb. of rice per head per day. The present annual consumption of rice is about 150,000 tons short of consumption in the immediate pre-war years. The years 1950 and 1951 were boom years, and generally there was no acute shortage of rice; it appears, therefore, that there has been a change in the eating habits of the people, and that perhaps as a result of the years of shortage they have become accustomed to a more varied diet.

COST OF RETAINED RICE IMPORTS.

(Pan-Malayan.)

Year.	Tons.	Value in \$.
1947 ..	237,866	58,126,089
1948 ..	449,739	184,197,540
1949 ..	495,029	200,036,762
1950 ..	435,958	175,585,707
1951 ..	498,929	218,739,700

(iii) OIL PALM.

34. Although there was only a small increase in the area planted to oil palms, there are indications that the industry is at the beginning of a period of expansion. On the coastal clays and muck soils, where rubber has never been high yielding, some estates are now replacing old rubber with oil palms. There are also instances of coconut estates replanting with oil palms. Many of the new areas are the nuclei of new plantations, but the necessary rapid expansion to full economic units is being held up through labour shortage.

35. The Malayan climate is very suitable for oil palms; yields are high even from unselected planting material, and exceptional yields are now being obtained from the progeny of the pre-war selections. Both the Department of Agriculture and some estates are engaged on breeding work, and some very promising new strains have been evolved.

36. No serious attempts have yet been made to encourage the cultivation of oil palms by smallholders. Although the crop is easy to grow in comparison with many other tropical tree crops, the difficulties associated with the extraction of the oil by smallholders are very great. There would undoubtedly be greater efforts to overcome these difficulties if palm oil were consumed locally, as happens in West Africa, but unfortunately, the smallholders regard palm oil as unpalatable.

37. The agricultural aspects of oil palms as a smallholders crop are favourable, but no progress is likely to be made until the transport of fruit bunches, the extraction of oil and kernels, and marketing can be efficiently organised. The Rural and Industrial Development Authority may well have a part to play in this connection.

38. The acreages planted with oil palms and the production of oil and kernels are as follows:

Year.	Planted Acreage.	Palm Oil. (In Tons).	Palm Kernels. (In Tons).
1947 ..	78,181 ..	39,115 ..	5,737
1948 ..	83,320 ..	45,257 ..	8,471
1949 ..	90,507 ..	50,561 ..	10,459
1950 ..	93,331 ..	53,171 ..	13,442
1951 ..	97,933 ..	48,274 ..	13,868

39. The erection of a large soap factory for Messrs. Lever Bros. in Kuala Lumpur will create a ready demand for locally produced vegetable oils and may be expected further to encourage the Malayan oil palm industry. The factory is expected to start operating in 1952.

(iv) COCONUT.

40. The area under coconuts has remained fairly constant since the war at approximately 500,000 acres; this is 100,000 acres less than the immediate pre-war area.

41. The price of copra rose steadily throughout 1950, and reached a peak of \$924 to \$1,008 per ton in January and February, 1951; this was followed by a steady fall in price to \$605 per ton at the end of the year.

42. Production figures show slight increases, but average yields, particularly on estates, are generally less than they were before the war. Coconuts suffered from the years of neglect more than other tree crops, and many estates have not fully recovered from the harm caused by the invasion of weeds and by neglected drains during the war years.

43. The main concentrations of coconuts are on the coastal flats of the west coast of Malaya where good drainage is essential for high production. Drainage schemes in the west coastal belt of Johore have already produced a marked improvement in the appearance of the coconuts.

44. There is a substantial import trade in copra (101,000 tons in 1951). Imports are usually higher than exports, which were 90,000 tons during 1951; Malaya is thus a net importer of copra. The volume of this trade depends upon the relative prices of copra and oil, and the trade is in a position to take advantage of disparities in those prices. It appears that the surplus local production is mainly exported as oil. There is a considerable internal consumption of oil and the meat of fresh fruit, and copra cake is widely used as feed for pigs. Malayan soap factories provide a not inconsiderable market for oil; during the year 43 factories manufactured 11,469,381 lbs. of soap.

PRODUCTION (IN TONS).
(FEDERATION OF MALAYA).

Year.	COPRA.		Coconut Oil.	Copra Cake.
	Estates.	Small- holdings.		
1947 ...	†	.. †	.. 51,186	.. 40,760
1948 ..	19,011*	.. 45,608*	.. 51,164	.. 37,970
1949 ..	36,957	.. 85,980	.. 63,698	.. 43,300
1950 ..	38,612	.. 110,866	.. 72,800	.. 47,819
1951 ..	39,422	.. 120,620	.. 86,397	.. 55,661

NET EXPORTS.

(PAN-MALAYAN).

Year.	COPRA.		COCONUT OIL.	
	Tons.	Value. \$	Tons.	Value. \$
1947 ..	45,439‡	.. 14,734,312‡	.. 41,112	.. 24,668,790
1948 ..	28,624‡	.. 14,018,149‡	.. 45,245	.. 45,531,182
1949 ..	24,424‡	.. 7,159,041‡	.. 60,504	.. 54,521,306
1950 ..	4,778	.. 14,902,910	.. 56,045	.. 60,747,279
1951 ..	10,878‡	.. 6,605,527	.. 68,139	.. 87,508,297

(v) PINEAPPLE.

45. Out of the 24,486 acres of pineapples 16,640 are in Johore and 3,876 acres in Selangor. The pineapples are grown on peat soils for sale mainly to the canneries. There was only a small increase in the area planted during 1951; applications for new alienations are under consideration, but not yet approved.

* July-December only. † Not available. ‡ Net imports.

46. In 1951, an Ordinance to provide for the regulation and improvement of the pineapple industry was passed. The principal objects of the bill are to strengthen the industry by enforcing minimum standards of canning equipment and to establish quality standards for the pack. The Ordinance provides for the appointment of a Joint Industrial Council on which representatives of all sections of the industry will sit. The duties of the Council will be the negotiation of agreements on prices and grades of fruit, the regulation of the production and marketing of pineapples, and the submission of recommendations on matters affecting the industry. There is also provision for imposing a cess on exports to provide funds to be used for the benefit of the industry.

47. A site has been selected for a Pineapple Experiment Station on peat soils in the State of Johore, and a programme of investigations into agronomic problems has been commenced. In general the yield per acre of pineapples in Johore is not as high as it should be and there is therefore every need to determine the causes of low yield and to evolve methods of rectifying them. It is unfortunate that bandit activity has seriously limited attention by the Department of Agriculture to these problems.

48. The following table shows the exports of canned pineapples from Malaya since 1947:

EXPORTS.

Year.		Tons.		Value. \$
1947	..	2,611	..	2,430,951
1948	..	4,099	..	3,652,621
1949	..	8,137	..	6,307,169
1950	..	14,671	..	12,203,911
1951	..	16,913	..	16,884,112

(vi) TEA.

49. In 1950, blister blight of tea made its first appearance in Malaya and it spread to all highland tea estates. There were some small outbreaks in the lowlands which caused no damage, as lowland temperatures are normally too high for its persistence. The Department has been studying the disease closely; some methods of control are now understood, and it is believed that the disease can be kept in check if precautions are taken.

50. In spite of blister blight and adverse weather conditions the fields recovered and production figures show an increase in crop.

MADE-TEA.

Year.		Production. lbs.		Exports. lbs.		Sold locally. lbs.
1947	..	1,242,285	..	108,069	..	885,913
1948	..	2,257,619	..	641,804	..	1,447,189
1949*	..	3,233,950	..	1,853,291	..	1,606,282
1950	..	3,317,930	..	1,660,350	..	1,610,782
1951	..	3,684,158	..	1,726,786	..	1,887,018

* Figures as supplied by estates. The excess of tea sold to tea produced is presumably due to a carry forward of stocks.

51. The following table gives, for 1951, statistics of acreages and production for highland and lowland estates :

	No. of estates.	Planted area. (Acres).	Area in produc- tion. (Acres).	Plantable reserve land. (Acres).	Production made-tea. (lbs.).
Highland ..	35 ..	5,345 ..	3,725 ..	3,250 ..	1,533,122
Lowland ..	11 ..	3,280 ..	2,350 ..	11,323 ..	2,151,036

(vii) FOODCROPS, VEGETABLES AND FRUIT.

52. The period was notable for the steep rise in prices of all locally produced vegetables. Vegetables and root crop production is mainly in the hands of the Chinese, and their resettlement caused a temporary fall in production; it may take some time before the new areas can make good those that have been abandoned. There is a large local demand for temperate vegetables, and production of these at Cameron Highlands is considerably augmented by imports from Australia and Sumatra.

53. The principal local fruits are durians, rambutans and mangosteens, and crops in 1951 were above average. The fruit harvests of Malaya are seasonal, and for long periods each year local fruits are scarce. There is a considerable import trade in apples and oranges.

54. One of the most important functions of the Agricultural Stations maintained by the Department is the production of budded fruit trees for sale. Rambutans and durians are the most popular and demand remains in excess of supply.

(viii) MANILA HEMP.

55. Interest in this crop has been created through the shortage of supplies from the Philippines. The Malayan climate is suitable for Manila hemp and a number of estates have established small trial areas. The Department has also undertaken some work on this crop and a number of field experiments have been laid down. Small observation plots of the principal varieties survived the war and variety trials with these and some "off-types" have also been established. The trials are in progress over a wide range of conditions and the indications are that Manila hemp will need the best soils that can be found in Malaya.

(ix) JUTE.

56. Preliminary trials with jute indicate that there is still much to be learnt about varieties and methods of cultivation in Malaya. The yields obtained have not been good, but the crop certainly warrants further investigation.

(x) CACAO.

57. Work on cacao ranks high in the Department's list of priorities. The importance of an alternative tree cash crop to rubber is fully appreciated. Climatic conditions are favourable, and the small pre-war observation plots that have survived are an assurance that cacao can make reasonable growth and yield

well under certain conditions. Valuable information is now being obtained from the early methods of establishment trials planted in 1949, in co-operation with estates and on Agricultural Stations. These cover a very wide range of conditions from partially cleared jungle to cleared land on all soil types; the establishment of cacao through rubber of various ages and spacings is also under trial.

58. The early work, of necessity, was done with unselected seed from the existing local stands of the Trinitario variety. During the past year importations were made of Trinitario selections to increase the genetic range for selection and breeding. Emphasis at the moment is being laid on the rapid propagation of West African Amelondo to provide material for future planting; until this material has been further multiplied and selections made from among the Trinitario introductions, the area under cacao in Malaya is likely to expand very slowly.

(xi) COFFEE.

59. In spite of the very high prices that have prevailed for the last two years there has been little new interest shown in coffee. Liberian coffee thrives well on most Malayan soils, particularly the coastal clays and muck soils, where it is often interplanted with coconuts. A few small estates still exist, but most of the crop is a mixed stand in smallholdings.

(xii) DERRIS.

60. This crop is still mainly grown by market gardeners for their own insecticidal requirements. The overseas market has shown a renewed interest in Malayan derris, but this has not yet led to any increase in the area planted.

(xiii) SAGO.

61. Sago is a smallholders crop confined to low-lying, swampy areas. The fronds are used for thatching and the stems sold for pig food or to the sago factories for the production of flour.

(xiv) SPICES.

62. The spices in common use, such as ginger, turmeric, chillies and sireh (betel leaf), are grown on a scale sufficient for the local market. The world shortage of pepper has resulted in a keen demand for the limited supplies of planting material, but new plantings have not been on the scale that might have been expected in view of the very high potential returns from this crop. The resettlement of Chinese squatters has mitigated against an expansion of acreage under pepper.

63. In Penang, the clove industry has shown little signs of recovery. Prices for dry cloves are high (\$163 to \$197 per cwt.) but the prices offered by the dealers for wet cloves have been insufficient to stimulate interest in the crop. The Settlement Government has approved a scheme to subsidise clove replanting, but the response so far has been poor.

(xv) TOBACCO.

64. Tobacco is a very remunerative cash crop in some areas, where it is grown in rotation with vegetables or as an off-season crop on the padi fields. Prices for cured leaves have reached \$1.85 per lb., and 85 cents is considered a very low price. It finds a ready local market for the manufacture of cigars, cigarettes and pipe tobacco.

(xvi) RAMIE.

65. Interest in ramie is sustained throughout the years by the enthusiasm of its advocates. The high quality of the fibre and the comparative ease with which it can be grown in some parts of the world, serves to maintain an interest in the crop and a reluctance to abandon further trials. During the last three or four years there have been numerous ramie experiments on all soil types, but nowhere have yields been good. The plant has shown a tendency for branching and early flowering; both of these faults may be due to climatic conditions. Further experiments are being planned.

C.—STOCK.

(i) CATTLE, BUFFALOES, GOATS AND SHEEP.

66. The principal characteristic of stock farming in Malaya is the shortage of proper grazing grounds, and the failure of stock owners to regard the provision of grazing or forage as part of their farming operations. Standards of maintenance are somewhat higher in those parts of Malaya where the oxen or the buffaloes are used for ploughing, and there are examples of stall feeding of goats, but, in general, although all types of stock are much cherished, they must fend for themselves on the roadsides and waste lands and enjoy a brief period of plenty in the few months between the padi harvest and the preparation of the fields for the next crop.

(ii) PIGS.

67. Squatter resettlement has inevitably resulted in a considerable reduction in the numbers of pigs owned by the Chinese farmers. This could hardly have been avoided, as it is necessary for the farmers to reduce their stock until the new farms come into production. The basic foodstuffs of the pig are sweet potatoes, tapioca and vegetable wastes, supplemented with purchased concentrates. In Malaya, the Chinese successfully follow their traditional system of intensive mixed farming in which pig manure is the main source of soil fertility.

(iii) POULTRY.

68. There has been an increase in the number of commercial poultry farms maintaining flocks of the most popular European breeds, and these are having an effect on the poultry of the towns. The Agricultural Stations of the Department also maintain flocks of poultry for sale and distribution. But in general the poultry of rural Malaya is still mainly composed of the indigenous breeds and the Chinese Canton fowls.

SECTION III.

THE DEPARTMENT OF AGRICULTURE—ITS
ORGANISATION AND ESTABLISHMENT.

A.—ORGANISATION.

69. A full report of the organisation of the Department is contained on page 11 of the Annual Report of this Department for 1949.

During 1951 a proposal was made for the creation of a new Branch to be called the Agronomy Branch. This Branch will be of equal status with Research and Field Branches and will be administered by the Senior Agronomist who will be responsible to the Deputy Director for all field trials. This proposal has since been approved by Government and will be implemented in 1952.

70. The administration of the Public Gardens, Kuala Lumpur, which hitherto had been under the control of the Department, was handed over to the Kuala Lumpur Municipality on 1st June, 1950.

B.—ESTABLISHMENT.

71. The establishment of the Department is shown in the chart at Table I. The staffing position which has been difficult during the last few years, was further aggravated by calls on the staff for Emergency duties, and at times the Department was operating with a staff of less than half its senior establishment. Of a total of 63 posts for senior technical officers at the close of 1951, no fewer than 32 were vacant as follows:

- 1 Deputy Director of Agriculture
- 15 Agricultural Officers
 - 1 Statistician
 - 2 Senior Lecturers
 - 1 Agricultural Economist
 - 1 Senior Plant Pathologist
 - 1 Senior Chemist
 - 3 Chemists
 - 1 Senior Chemist (Soils)
 - 3 Chemists (Soils)
 - 2 Botanists
 - 1 Entomologist.

C.—SENIOR STAFF CHANGES.

(i) BRANCH HEAD POSTS.

(1) 1950.

72. (a) *Head Office (Administration).*—Dr. A. E. S. McIntosh, Deputy Director of Agriculture, continued to act as Director of Agriculture until the 7th February, 1950, when Mr. O. J. Voelcker, c.B.E., Director, West African Cacao Research Institute, assumed duty in the post. Mr. R. G. Heath, Chief Field Officer, ceased to act as Deputy Director of Agriculture when Dr. A. E. S. McIntosh returned to his substantive post on the 7th February, 1950.

TABLE I.

DEPARTMENT OF AGRICULTURE, 1951.

Organisation and Establishment by Branches (excluding Clerical and Non-technical Minor Posts).

DIRECTOR.

DEPUTY DIRECTOR.

RESEARCH BRANCH.	FIELD BRANCH.	ECONOMICS AND PUBLICATIONS BRANCH.	EDUCATION BRANCH.	ADMINISTRATION BRANCH.	MISCELLANEOUS POSTS.
1 Chief Research Officer	1 Chief Field Officer	1 Agricultural Economist	1 Principal, College of Agriculture	1 Personal Assistant to Director of Agriculture	1 Horticultural Officer Penang
7 Heads of Divisions— Senior Botanist Senior Chemist Senior Chemist (Soils) Senior Agricultural Officer (Research) Senior Entomologist Senior Plant Pathologist Canning Officer	1 Personal Assistant to Chief Field Officer 6 Senior Agricultural Officers 12 Agricultural Officers	1 Assistant to Agricultural Economist	1 Registrar and Bursar 2 Senior Lecturers		
14 Other Senior Officers 5 Senior Officers (<i>Leave Reserve</i>) 23 Agricultural Assistant Service Scheme 38 Agricultural Subordinate Service Scheme 14 Miscellaneous Junior Technical Posts	4 Other Senior Officers 7 Senior Officers (<i>Leave Reserve</i>) 98 Agricultural Assistant Service Scheme 147 Agricultural Subordinate Service Scheme		9 Agricultural Assistant Service Scheme		1 Horticultural Assistant
102 Posts.	276 Posts.	3 Miscellaneous Junior Technical Posts 5 Posts.	2 Miscellaneous Junior Technical Posts 15 Posts.	3 Posts.	2 Posts.

73. Mr. H. D. Meads, Personal Assistant to Director of Agriculture, relinquished duty on the 25th March, 1950, to proceed on vacation leave and Mr. H. F. Logan, Personal Assistant to Chief Field Officer, was appointed to act in the post with effect from the 26th March, 1950.

74. (b) *Field Branch*.—Mr. R. G. Heath, Chief Field Officer, relinquished duty on the 25th March, 1950, to proceed on vacation leave and Mr. J. L. Greig, Senior Agricultural Officer, was appointed to act as Chief Field Officer with effect from the 26th March, 1950. On the return from leave of Mr. R. G. Heath on the 14th November, 1950, Mr. J. L. Greig ceased to act as Chief Field Officer and was temporarily stationed at Headquarters until the 28th November, 1950, when he left on vacation leave.

75. (c) *Research Branch*.—Mr. R. G. H. Wilshaw, Chief Research Officer, was seconded for duty with the Organization and Methods Adviser with effect from the 12th December, 1949, and was later released for special duties in connection with the Emergency. Dr. T. A. Buckley, Senior Chemist, continued to act as Chief Research Officer throughout 1950.

76. (d) *Agricultural Education Branch*.—Mr. O. M. Lee, Senior Lecturer, continued to act as Principal, College of Agriculture, until he proceeded on leave on the 14th July, 1950, when Dr. W. N. Scott, Agricultural Officer, took over duty as Acting Principal, College of Agriculture.

77. (e) *Economics and Publications Branch*.—Mr. H. L. Barnett, Registrar of Statistics, Federation of Malaya, continued to act as Agricultural Economist in addition to the duties of his substantive appointment until the 1st March, 1950, when Mr. R. G. Heath, Chief Field Officer, was appointed to act in the post in addition to his own duties. On the departure of Mr. R. G. Heath on leave, Mr. J. L. Greig, Senior Agricultural Officer, was appointed to act concurrently as Agricultural Economist and Chief Field Officer from the 26th March to the 13th November, 1950. Mr. R. G. Heath again took over duties of Acting Agricultural Economist in addition to his own duties on his return from leave on the 14th November, 1950.

(2) 1951.

78. (a) *Head Office (Administration)*.—Dr. A. E. S. McIntosh, Deputy Director of Agriculture, proceeded on leave on the 9th September, 1951, on medical grounds and has since been invalided from the service. Mr. R. G. Heath, Chief Field Officer, officiated as Deputy Director of Agriculture, in addition to his own duties, with effect from the 10th September, 1951. On the 9th November, 1951, Mr. R. G. Heath was relieved of the duties of his substantive post on the appointment of Mr. J. R. Curry, Senior Agricultural Officer, as Acting Chief Field Officer.

79. Mr. H. F. Logan, Personal Assistant to Chief Field Officer, continued to act as Personal Assistant to Director of Agriculture throughout the year except for the period when he was on leave from the 22nd March to the 12th September, 1951, during which period Mr. J. J. Holmes, Assistant to Agricultural Economist, acted as Personal Assistant to Director of Agriculture in addition to his own duties following his return from leave on the 5th April, 1951.

80. (b) *Field Branch*.—Mr. J. R. Curry, Senior Agricultural Officer, was appointed to act as Chief Field Officer with effect from the 9th November, 1951.

81. (c) *Research Branch*.—Mr. R. G. H. Wilshaw remained seconded for full-time Emergency work. Dr. T. A. Buckley, Senior Chemist, continued to act as Chief Research Officer until the 23rd October, 1951, when he relinquished duty to proceed on leave prior to retirement. Mr. R. B. Jagoe, Senior Botanist, was appointed to act as Chief Research Officer with effect from the 25th October, 1951.

82. (d) *Agricultural Education Branch*.—Mr. O. M. Lee, Senior Lecturer, took over the duties of Principal, College of Agriculture, from Dr. W. N. Scott, with effect from the 15th January, 1951, on his return from leave. Mr. Lee was subsequently promoted to the post of Principal, College of Agriculture, with retrospective effect from the 31st July, 1949.

83. (e) *Economics and Publications Branch*.—Mr. J. R. Curry, Senior Agricultural Officer, acted as Agricultural Economist in addition to his appointment as Acting Chief Field Officer with effect from the 9th November, 1951.

(ii) RECRUITMENT.

84. Mr. A. E. Billington, M.A., A.R.I.C., was appointed Canning Officer, Malayan Agricultural Service, with effect from the 7th April, 1950, and was posted to the Canning Research Station at Johore Bahru.

85. Mr. J. R. Milburn, B.sc. (Agr.) was appointed Agricultural Officer, Malayan Agricultural Service, with effect from the 7th November, 1950.

86. Mr. F. B. Brown, B.sc. (Hons. Bot.) was appointed Botanist, Malayan Agricultural Service, with effect from the 29th June, 1951.

87. Mr. J. L. B. Hitchcock, B.sc., (Agr.) was appointed Agricultural Officer, Malayan Agricultural Service, with effect from the 13th October, 1951.

88. Mr. E. W. Bewlay was appointed Agricultural Development Officer with effect from the 1st January, 1950.

89. Mr. J. A. Cox was appointed Agricultural Development Officer with effect from the 13th January, 1951.

90. Mr. A. Cumming was appointed Agricultural Development Officer with effect from the 5th February, 1951.

91. Mr. N. Kanagaratnam was appointed Agricultural Development Officer with effect from the 1st March, 1951.

(iii) TRANSFERS.

92. Mr. O. J. Voelcker, C.B.E., on transfer from Gold Coast to fill the post of Director of Agriculture, Federation of Malaya, with effect from the 13th January, 1950.

93. Mr. J. L. Greig, Senior Agricultural Officer, left on transfer to North Borneo as Director of Agriculture with effect from the 26th May, 1951.

94. Mr. P. A. Gething, B.A., A.I.C.T.A., was transferred from Nigeria to Malaya as Agricultural Officer with effect from the 24th August, 1951.

(iv) RETIREMENTS.

95. Mr. C. W. S. Hartley, Senior Agricultural Officer (Research), retired with effect from the 1st November, 1950, on medical grounds.

96. Mr. H. D. Meads, Personal Assistant to the Director of Agriculture, retired with effect from the 1st February, 1951, on medical grounds.

97. Mr. J. Fairweather, M.B.E., Senior Agricultural Officer, retired with effect from the 22nd February, 1951, on reaching the age limit.

98. Mr. Gunn Lay Teik, O.B.E., Chemist, retired with effect from the 30th August, 1951, at his own request.

99. Dr. A. E. S. McIntosh, Deputy Director of Agriculture, relinquished duty on the 8th September, 1951, to proceed on leave prior to retirement on medical grounds.

100. Mr. A. Thompson, Senior Plant Pathologist, proceeded on leave with effect from the 22nd September, 1951, prior to retirement at his own request.

101. Dr. T. A. Buckley, Senior Chemist, relinquished duty on the 23rd October, 1951, to proceed on leave prior to retirement at his own request.

SECTION IV.

WORK OF THE DEPARTMENT OF AGRICULTURE.

A.—GENERAL.

102. Paragraphs 129 to 448 record in some detail the work of the various branches of the Department during the years 1950 and 1951. For the convenience of the lay reader matters of general interest are summarised below.

103. Fundamental agricultural research, which includes plant breeding, soils, entomological and plant pathological investigations, is carried out by the Research Branch whose officers though stationed at the research laboratories in Kuala Lumpur, work on research problems throughout the Federation. Agronomic investigations are carried out by the Field Branch and the Agronomy Division of the Research Branch.

104. The Field Branch has remained in executive control of all field investigational work with the exception of that being carried out at the Federal Experimental Stations, Serdang and Kuala Lumpur. Agronomic investigations may be carried out on Agricultural Stations that are either entirely Federal or State financed or in some cases financed jointly by both the Federal and the State or Settlement Governments. These latter are usually State or Settlement Agricultural Stations in receipt of a grant-in-aid for the investigational work they undertake in addition to their normal demonstration and extension purposes. There are 23 dryland and 47 padi stations under the control of

the Field Branch. In addition to the investigations being carried out at Agricultural and Padi Stations, there are 57 experiments on estates which form part of the field investigations programme.

105. Although there are eleven State or Settlement Departments of Agriculture, each programme of investigation is designed to serve a common policy which has been considered centrally by a Standing Committee on Investigations. This Committee is broadly based, and on it are representatives of the Field, Research and Economic branches under the chairmanship of the Deputy Director of Agriculture. In November, 1950, and again in January, 1952, a full conference of all the senior officers of the Department met to review the work of the previous year, to amend where necessary and, through discussion, plan the work of the future. The special investigational needs of individual States and Settlements are not overlooked, and in presenting his case and proposals for particular investigations the State or Settlement Agricultural Officer has the benefit of the critical advice and technical assistance of the specialist officers of the Research Branch. The main programme is essentially the result of team work, and although there are important differences in climate and soils between the various parts of Malaya, nowhere are they sufficiently dissimilar as to make the work in one area unimportant to another. The foregoing outlines an organisation for the central control of investigations. These general remarks should be closed with the assurance that there is scope for the individual to pursue investigations on work of very local interest, and within the limits of staff and other priority work such investigations receive support.

(i) RUBBER.

106. The demand by smallholders for budwood has been small compared with the quantity available on Departmental and Rubber Research Institute Stations. The demand for clonal seedlings and germinated seed, however, exceeded the supply, which was increased by some 1,400,000 during 1951. The development of *kampong* nurseries has been a welcome innovation and is capable of considerable extension.

(ii) PADI.

107. Intensive work over the past three years has led to preliminary releases of improved padi seed in Malacca. In other padi growing districts, improved seed is unlikely to be available before 1953. Seed of standard varieties is, however, available to farmers who, through some cause, are short of planting material. Over 15,000 gantangs were so supplied to farmers in 1951.

108. Manurial trials have shown that increases in yield in the order of one-third can be obtained in Kelantan by the application of NPK fertilisers. On the poorest Kelantan soils the increase is much greater. The appropriate fertilisers were distributed free to some 300 *kampong* leaders in 1951 as an initial move to popularising the use of artificial fertilisers. The padi from these plots has not yet been harvested but there is promise that the expected increases may be obtained, and there are indications of a substantial demand from farmers for fertilisers in 1952. Manurial results in other padi growing areas in the Federation have not been so promising.

109. Mechanical preparation of the land for padi planting has now evolved from the experimental stage to that of practical application on firm bottom clays. In Selangor, Perak and Kelantan, the Rural and Industrial Development Authority, with the technical advice of the Department, has initiated schemes for making tractor cultivation available to padi farmers. In 1951, only six tractors were in use by the Rural and Industrial Development Authority in time for preparation of the land for the 1951-52 padi crop, but there developed later, a keen demand by padi planters for the use of tractors.

110. Work on mechanical harvesting and threshing continued, but has not reached the stage of practical application. A small mobile padi mill was operated in Kelantan by R.I.D.A. in the latter part of 1951, and promises to be very successful.

111. Research on padi soils has shown the harmful effects of certain compounds of sulphur and aluminium on the growth of padi. These compounds in high concentration are characteristic of the *gelam* lands which form an appreciable area of potential padi land. The addition of lime to these lands, coupled with good drainage, give promise of improving the yields of padi.

112. Laboratory experiments confirmed the need for ample aeration to the roots of young padi plants, but when the plants get older, root aeration does not appear essential. These facts are of importance in understanding the fundamental requirements of padi cultivation.

(iii) OIL PALM.

113. Pedigree strains of the unique Departmentally selected "Dumpy" type of oil palm continue to give promise of high commercial value. Pedigree seedlings for planting 400 acres have been supplied to interested estates.

114. Improvement in percentage of pericarp and oil in the Deli type is being attempted by breeding with certain West African oil palm varieties.

(iv) CACAO.

115. A range of types representative of the best commercial cacao has been introduced into Malaya, and the programme of rapid multiplication has started.

116. Multiplication by budding has proved satisfactory, but there is still difficulty in evolving a technique to give equally satisfactory results by cuttings.

117. In establishing cacao in Malaya, experiments have confirmed the need for shade during early growth. An economical method of establishment is indicated by the technique of planting cacao through thinned jungle. Cacao planted through mature rubber has in general not done well, but experiments are in progress to find out whether cacao can be established through young rubber.

118. Diseases and pests, though numerous, are not at present of comparable importance with those which attack cacao in South America or West Africa. Monkeys and squirrels may prove troublesome.

(v) TEA.

119. Practical control measures against Blister Blight—the disease of recent occurrence in Malaya—have been evolved and are proving effective.

120. The new technique of using cuttings as opposed to seedlings for the establishment of tea fields is under investigation. Selected bushes are being reproduced vegetatively with a view to determining the best commercial clones.

(vi) PINEAPPLE.

121. Preliminary experiments indicate that the application of potash fertilisers to peat soils increases the yield and health of pineapples. Good drainage is, however, the first essential to good yields on peat. Control of ripening by plant hormone sprays is under investigation.

122. On the advice given by the Department, considerable progress has been made in improving the quality and uniformity of the pineapple pack.

(vii) FIBRES.

123. Trials with jute have generally been disappointing. A limiting factor to Manila hemp cultivation in other parts of South East Asia is the presence of Bunchy Top disease. Plants suspected of Bunchy Top in Malaya were tested with negative results. There is, therefore, as yet no definite confirmation that this disease occurs in Malaya.

(viii) LIVESTOCK.

124. Superior varieties of goats have been imported and bred at Serdang. From 12 animals imported in 1949 the herd of pure breeds now number 24 head and cross-breeds number 42. The stage will shortly be reached when these superior varieties can be distributed to certain agricultural centres throughout the Federation.

125. During the period covered by this report, 399 Middle White pigs were distributed by the Department, mainly to new villages, and 2,266 head of improved poultry were also distributed, mainly to poultry breeders and to *kampongs*.

126. The first introduction of sexed Bali Cattle into Malaya was undertaken by the Department in 1951.

(ix) COLLEGE OF AGRICULTURE.

127. Both in 1950 and in 1951 the number of applicants—particularly of Malays—for Diploma course scholarships has been disappointingly few. Rural Development Officers joined the course in 1951.

(x) RESETTLEMENT.

128. During 1951 the Field staff of the Department has played an increasing part in the agricultural development of new villages.

B.—RESEARCH AND INVESTIGATION.

1.—PADI (RICE).

(i) BREEDING AND SELECTION.

129. (a) *Variety Trials*.—The 1949-50 season completed the first post-war, three-years period of padi variety trials of the best known varieties at 34 Padi Stations in major padi-growing areas throughout Malaya. Statistical analyses of the results have been a major item of the work of the padi research section of the Botany Division of the Department during 1950 and 1951.

130. In most cases adequate data from the three seasons were obtained for a combined three-year period analysis, but at a number of Padi Stations, damage by adverse weather conditions, pests or disease in one or more seasons was severe, and the established variety trial was continued for a fourth season (1950-51). A report on yield in these series of padi variety trials has been submitted and is being prepared for publication. It seems possible that in some padi-growing areas appreciable yield increases should be obtained by the wider use of varieties introduced from other parts of the Federation, and specific recommendations have been made accordingly. Analyses of the three-years period records of the Malacca variety trials, for instance, established Reyong 6 from Kedah as the best yielding variety in central Malacca. Its adoption by padi planters in place of the varieties Nachin and Serendah Kuning will, however, depend on favourable threshing and eating qualities; but these seem satisfactory, as demand for seed is increasing.

131. New trials, commenced in the 1951-52 season, are aimed at further comparison of introduced and local standard varieties, and trial of the more promising varieties of secondary prominence. These trials will be continued for one or two more seasons.

132. (b) *Variety Survey*.—In addition to the trials of the primary varieties, the survey of all Malayan varieties of padi was continued with collection and maintenance of variety observation lines at suitable Padi Experiment Stations. These collections are used for variety identifications and for systematic study of genetic characters, for use in future breeding work.

133. The results of these observations and studies have also indicated varieties suitable for trial and selection in particular areas.

134. Newly-found varieties have been added each season. In 1951, a number of duplicates have been discarded, and the lines in each collection are now as follows:

- (i) Long term varieties at Titi Serong Padi Experiment Station, Perak, 1951/52—141 varieties.
- (ii) Medium and short term West Coast (and Pahang-Johore) varieties at Pulau Gadong Padi Experiment Station, Malacca, 1951/52—454 varieties.
- (iii) Medium and short term East Coast lines at Kota Bharu Experiment Station, Kelantan, 1951/52—321 varieties.

135. (c) *Variety Selection*.—Ear-row selection for isolation of strains with maximum yield and straw strength within several of the most popular local varieties was continued and is in progress as follows:

Variety.	Area of Application.	Padi Expt. Station.	Foundation Stock.	No. of Lines.		
				1949-50	1950-51	1951-52
Serendah Kuning	Negri Sembilan and parts of Malacca, Pahang and N. Johore	Kendong and Ampang Tinggi, Negri Sembilan	1946-47	103	67	67
Nachin	Malacca coast	Pulau Gadong, Malacca	1946-47	136	75	75
Radin Ebos ..	Kedah and Perlis	Telok Chengai, Kedah	1947-48	532	373	170
Mayang Sa-Batil	Penang and, by recent adoption, Krian	Genting, Penang	1947-48	285	188	90
Seraup	North Krian and other deep soil areas	Titil Serong, Perak	1948-49	1,000	704	300
Siam	Malaya, except Krian	Pulau Gadong, Malacca	1948-49	757	456	184
Acheh Puteh	Tanjong Karang, Kuala Selangor	Panchang Bedena and Sungai Burong, Selangor	1949-50 1950-51	750 —	444 750	} 535
Anak Naga ..	Kelantan	Kota Bharu, Kelantan	1950-51	—	—	
Mayang Sa-Gumpal	Kelantan	Jelawat, Kelantan	1951-52	—	—	Foundation Stock

136. Ear-row selection of Serendah Kuning and Nachin has reached the earliest stages of preliminary field testing of selected strains at Padi Test Stations.

137. As a result of the 1949-50 preliminary field trials at Jasin Padi Station, Malacca, with some of the most promising Serendah Kuning lines, interest is being shown by local farmers in Serendah Kuning, Kendong No. 3, and a preliminary release of seed of this selection in 1950-51 to selected planters near Jasin has resulted in an increased demand. Yields equivalent to over 600 gantangs per acre have been obtained, which is very satisfactory for padi in this region.

138. (d) *Disease Resistance*.—In addition to selection for yield and straw strength, attention is also being given to selection for disease resistance, in particular resistance to *Piricularia oryzae* and *Helminthosporium oryzae* in the varieties Serendah Kuning, Siam and Nachin. No strains of notable resistance have yet been found, however.

139. (e) *Natural Cross-pollination*.—With reference to the technique of pure line selection, studies of natural cross-pollination were continued and a report was published (*Malayan Agricultural Journal*, April, 1950). Results showed that the amount of natural cross-pollination which occurred was probably less than 1 per cent. Current experiments and resulting progenies, however, show so many unexpected and unaccountable segregations of characters that further work is suspended till homozygous material has been prepared.

140. (f) *Hybridization*.—A programme of hybridization to combine desirable strong straw quality with the otherwise excellent variety Siam 29 is being developed.

141. Technique is not yet satisfactorily established, but artificial cross-pollination in 1950-51 of some 1,000 flowers involving 19 crosses resulted in a 9 per cent. set of seed. Of these, 44 F_1 plants from 13 crosses have been raised and, in spite of some damage by stem-borers and *Leptocorisa*, a satisfactory quantity of F_2 seed has been obtained. Attempts to improve pollination technique have met with incomplete success and further investigation is in progress.

142. Crossing is being continued on a larger scale with the current 1951-52 crop: so far, 189 ears have been pollinated involving 80 crosses.

143. (g) *Dates of Sowing Experiments*.—Dates of sowing experiments are in progress in Negri Sembilan, Pahang and Johore. Lack of adequate water control and difficulties of providing it in parts of these States makes risk of flood damage a major hazard to be avoided, if possible, by some alteration in season. Similar experiments are being carried out in Kelantan to study photoperiodic responses of varieties in the variety collection there.

(ii) PADI INSECT PESTS.

144. (a) *Stem-borers*.—Tests with "parathion" formulations against stem-borers gave negative results.

145. Tests with Agrocide wettable powder on young padi showed a marked reduction in borer attack for up to one month, but not longer. This was not due to its effect on borers already in the stems, but to prevention of attack.

146. A number of puparia of the Tachinid flies *Paratheresia claripalpis* v.d. Wulp. and *Metagonistylum minense* Towns. were received by air from the Commonwealth Bureau of Entomological Research in Trinidad for laboratory tests on the control of stem-borers. No success was achieved with *Metagonistylum*, but *Paratheresia* was successfully reared on larvæ of *Proceras polychrysus* (Meyr.) and *Chilo suppressalis* (Walk.).

147. It is hoped that a field trial with *Paratheresia* will be possible in 1952.

(b) BUGS.

148. *Scotinophara coarctata* F. (Malay=*Kutu Bruang*) has been controlled with a mixture of D.D.T. and B.H.C., which has been found to be more effective than either chemical used alone.

149. *Leptocorisa acuta* Thnbg. (Malay=*Pianggang*). Agrocide 3 dust gave a good kill of *Leptocorisa* in a small trial at Kuala Sungei Bharu in Malacca, but the trial area was soon re-invaded.

(iii) HYDROPONIC EXPERIMENTS WITH PADI.

150. Experiments have been carried out which confirm that padi plants require an external oxygen supply to the roots in the early stages of growth. A further experiment was then set up in which 12 plants were grown for four weeks with daily

aeration, the aeration was then stopped in half the number, and carried on in the other half. The non-aerated and aerated plants grew equally well and had begun to flower when removed for leaf analysis. This supports the hypothesis that, after the initial few weeks growth, padi plants are able to depend on an internal oxygen supply to their roots.

(iv) SOIL FERTILITY EXPERIMENTS.

151. A programme of analyses of the leaves of padi plants at time of flowering was commenced in 1951 in order to relate uptake of major minerals with soil fertility and yields of grain. The work will continue each padi season until the required data have been accumulated.

152. Trace elements have also been investigated both by pot experiments and spectrographic analyses of soils, but without results so far.

(v) PADI SOILS SURVEY.

153. The only fact so far established from this survey was that the amount of "available" potash, as determined by the Neubauer method, was always high in the best yielding soils. The poor yielding areas were generally low in potash, although some were fairly high, which presumably indicates an additional inhibitory factor.

154. Spectrographic analyses for trace elements in a few of these soils were done at the Macauley Institute, but it was not possible to obtain values for the most important trace elements from a nutrition point of view. There was nothing in the results to indicate a toxic quantity of any element determined.

(vi) TOXIC CONDITIONS IN PADI SOILS.

155. Many areas of coastal swamp alluvium in Malaya are characterised by almost pure stands of *Melaleuca leucodendron* (Malay=*Gelam*). These areas, when cleared for cultivation, are often associated with poor crops.

(a) SULPHUR.

156. The smell of hydrogen sulphide is often very strong in *gelam* soils, and a considerable amount of investigation into the amount of sulphur in these soils has been carried out.

157. The soils at Duyong, Malacca, were found to be variable but, in general, only slightly sulphurous; most samples of soil taken had little smell of sulphide and did not show the characteristic blackening when exposed to the air. The amount of sulphur in the samples rarely exceeded 0.3 per cent. In the Pulau Gadong, Malacca, area, on the other hand, the soils had a very strong smell of sulphide; they rapidly turned black on exposure to the air, and they had, in some cases, as much as 6 per cent. of sulphur in the samples taken at 24 to 36 ins.

(b) ALUMINIUM.

158. Connected with the sulphur in soils and the acidity which can develop on drying out and consequent oxidation, is the question of soluble aluminium. The amount of "active" aluminium in a large number of samples has been determined by extraction with 0.5N acetic acid. This method, though far

from ideal, gives an indication of the varying amounts of "active" aluminium in different soils if the experiments are carried out under closely controlled conditions. Values up to 4,000 p.p.m. Al_2O_3 were noted in certain very sulphurous soils from Paya Besar, Kuantan, Pahang, and Pulau Gadong, Malacca. Samples from a number of established padi areas such as Tanjong Karang, Selangor, and Krian, Perak, gave values of the order of 400 p.p.m.

159. Further investigation into the toxicity of aluminium to padi seedlings has been carried out using the Neubauer technique.

160. To see if the addition of aluminium salts to a good padi soil would have the same effect, a sample of a reasonably good yielding padi clay was utilised for the Neubauer test. Aluminium, in the form of aluminium sulphate solution, was applied at rates varying from 200 to 5,000 p.p.m. Al_2O_3 . Each treatment was in duplicate. The 200 p.p.m. treatment appeared to have a slight stimulant effect. The 600 p.p.m. treatment did not have a serious retarding effect, but the heavier treatments did. Increasing amounts of Al caused progressive browning of the leaves. At the higher amounts the onset of symptoms was quicker and browning of the leaves more severe. A very striking feature was that the leaves rolled up very tightly soon after treatment. In appearance the aluminium-treated plants were similar to those grown in the Paya Besar soils.

161. Various analyses and experiments have been made, and the results show that the sulphur and aluminium are both toxic to padi, though which plays the major part in acid soils is not yet known. In practice, this difficulty is not so important, as a large amount of easily soluble aluminium will be generally associated with high acidity. The remedies for these in the field are good drainage and liming; trials of this nature are being carried out at Paya Besar, Kuantan.

2.—OIL PALM.

(i) BREEDING AND SELECTION.

162. Selection records for individual tall, "dumpy" and "dumpy" x tall palms in pedigree families in Fields 3A and 4 at the Federal Experiment Station, Serdang, Selangor, were maintained.

163. Selection is also being made of "tenera" and "pisifera" palms amongst particular lines of the 1926-28 collection of introductions of West African varieties in Fields 18 and 19, for use in the breeding programme.

164. The breeding programme is concerned primarily with development of:

- (a) "dumpy" palms with their short, stout trunks and potentially lower harvesting costs, and
- (b) "tenera" palms with thick pericarp and high oil extraction rates.

165. The co-operation of estates in providing land for field trials has made good to some extent the lack of suitable departmental sites for this purpose. Shortage of departmental land for oil palm trials remains a serious handicap.

(a) "DUMPY" PALMS.

166. The "dumpy" family of 63 palms appears to be more or less uniform for the character of "dumpiness", with 9 ft. girth at 3 ft., and 7 ft. 6 in. height to base of first bunch at $10\frac{1}{2}$ years.

167. The bunches of most of the palms have, unfortunately, a high proportion of parthenocarpic fruits and unfertilised flowers, giving a dirty appearance and a somewhat low percentage of good fruits in a bunch. One or two good palms are, however, satisfactory in this respect, and improvement in the best palms should be obtained by breeding.

168. Sufficient legitimate "dumpy" progeny for planting 400 acres has been distributed to estates for observation and yield trial. It is considered that this acreage, well distributed as it is, should provide sufficient data on which to judge performance, and, in conjunction with other progeny trials to be planted, selected parents for further breeding.

(b) "TENERA" AND "PISIFERA" PALMS.

169. Fundamental work in West Africa on the genetic relationships of "dura", "tenera" and "pisifera" types suggests possibilities of developing high yielding "tenera" palms with high oil extraction rates.

170. Two "pisifera" palms producing good bunches of full-sized fruit have been found in the "tenera" lines of the 1928 collection of West African varieties at the Federal Experiment Station, Serdang. Seed has been germinated, showing unusual fertility for "pisifera" palms. From these two "pisifera" palms, selfed progenies will be produced to increase the parental range of fertile "pisiferas" for future breeding. "Pisifera" pollen has also been used in breeding.

171. Pedigree "tenera" (*dura* x *pisifera*) seed, seed from selfed "tenera" palms, and "pisifera" pollen have been imported from the Oil Palm Research Station, Nigeria.

172. The introduction of pedigree "tenera" seed from Nigeria is being made to introduce additional parental material and, by comparison, to confirm that the Malayan "Deli" "dura" palm behaves in the same way as the West African "dura" when crossed with "pisifera". The "pisifera" pollen has been used in cross-pollination of a selected "dumpy" palm.

(c) "DELI" PALMS.

173. Breeding within the "selfed" progenies of the tall Elmina selections is being continued to carry this material into a second generation; 26 bunches have been pollinated and harvesting has just commenced.

174. A comparative trial of material selected by commercial organisations and by the Department of Agriculture is to be planted. Nurseries have been established and planting will be carried out late in 1952.

(ii) REPLANTING.

175. Pedigree "dumpy" and "dumpy" backcrossed seedlings have been planted in a replanting experiment in Field 5, Federal Experiment Station, Serdang.

(iii) GERMINATION EXPERIMENTS.

176. Experiments re-affirmed that full sun and regular watering were important primary factors in successful germination. Successful results were obtained with sowing fresh, cleaned seed in medium sand, in full sun, with regular watering morning and evening. Germination approximated to 75 per cent. at three to four months.

177. Soaking seed in stagnant water for eight days, and then cleaning, gave results (average=80 per cent.) in a relatively small series of tests which were consistently superior to normal cleaning of seed, but not with statistical significance. Soaking the seed in stagnant water prior to removing the pericarp appeared to be more effective than soaking in running water in a stream.

(iv) NUTRIENT STATUS AND pH VALUES OF SOILS.

178. Oil palm seedlings were grown in water cultures and in large pots of good jungle soil at different pH values. Cultures and soils at pH 3.5 and 4.6 gave much better growth of seedlings than the higher values, and showed very clearly that oil palm seedlings have a preference for acid conditions.

179. Seedlings grown in the water culture of pH 3.5 were richer in phosphorus and potash than those grown at higher pH levels.

(v) LEAF ANALYSES.

180. As a corollary of the soil and water cultures studies, leaf analyses of mature oil palm pedigree progenies which have given markedly different responses to manures were carried out. Leaf samples were taken at tri-monthly intervals during 1950 and 1951. The results to-date have been analysed statistically and have proved to be very interesting. They indicate that the amount of calcium in the leaf is directly related to bronzing, and that palms with the most severe bronzing have the highest calcium content, while potassium is highest in the healthiest and highest yielding palms.

(vi) OIL PALM INSECT PESTS.

181. Considerable damage was caused to young oil palms in the Klang area of Selangor by *Oryctes rhinoceros* L. The area had previously been under rubber and this had been poisoned with sodium arsenite to make way for oil palms. Larvæ of *Oryctes* were abundant in the disintegrating rubber wood and also in the rotting stumps, many of which were still standing.

182. *Oryctes* adults appear to show a marked preference for coconuts when these and oil palms are together. Attack on oil palms is, however, less obvious and they can withstand much more severe attack.

(vii) OIL PALM DISEASES.

183. (a) *Helminthosporium Leaf Disease*.—The pathogenicity of a species of *Helminthosporium* commonly associated with a disease of oil palm seedlings, in which large areas of the young leaves are killed, was tested on seedlings grown in pots. The fungus was unable to invade plants provided with an adequate supply of water but plants watered only once a week were attacked and killed in two months. This suggests that (as

observed in the field) the practice of mulching oil palm seedlings to conserve soil moisture can be of assistance in preventing *Helminthosporium* attack.

184. (b) *Vascular Wilt*.—Several diseased specimens have been examined to discover whether the wilt of oil palms reported from West Africa as being caused by *Fusarium oxysporum* is present in Malaya but so far results have been negative. One specimen in which the vascular bundles of the stem were blackened (a symptom of *Fusarium* wilt) was received but there was no trace of fungus mycelium in the affected vessels and only bacteria could be isolated from the tissues. External symptoms similar to those associated with the West African vascular wilt (leaf bending and cracking of the petioles) have been observed in several localities and approximately 1.5 per cent. of the palms on one estate were affected but no parasite could be found to be associated with the condition.

185. (c) *Stem-rot*.—A fungus (*Ganoderma* sp.) not hitherto recorded locally on oil palm was found on a plant killed by stem-rot. This fungus closely resembles *G. pseudoferreum* but mycelial growth in the two species is distinct.

3.—COCONUT.

(i) SELECTION AND BREEDING.

186. The selection of coconut palms at the Federal Experiment Station, Port Swettenham, and on a local estate was completed, resulting in selection of—

Eighteen tall palms on a local estate and 50 palms on the Federal Experiment Station, Port Swettenham, which included tall, dwarfs and semi-talls.

Emphasis has been given for a semi-tall type of palm, and standard size of nut around 250 to 280 grammes dry copra, as well as maximum copra and oil production.

187. It is of interest to note that these selected palms represent illegitimate progeny of palms selected on several large estates, material collected on small holdings, and imported seed of selected palms in both the Philippines and Ceylon.

188. Shortage of staff continues to prevent the initiation of the breeding programme.

(ii) COCONUT PALM INSECT PESTS.

189. The most serious pest of the year 1950 was a very extensive outbreak of the leaf-eating caterpillar *Artona catoxantha* Hamps. on several estates in Krian and Province Wellesley. On one estate some 2,000 acres were attacked, the damage starting in a small way in April and continuing until November. This is later than any previous record for over twenty years and the intensity may have been increased by absence of the usual wet season, with high winds commencing in September. A TIFA fogging machine was used to fog 700 acres with DDT in oil, and helped to prevent the pest spreading. Parasitism by the Tachinid parasite *Ptychomyia remota* Ald. was much lower than usual on the most affected estate; figures of 80 to 100 per cent. parasitism were recorded on an adjoining estate where no treatment was applied.

190. *Promecotheca Cumingi* Baly, the Philippine leaf-mining beetle, was discovered in Singapore early in April, 1951. An account of this outbreak has been published in the *Malayan Agricultural Journal* for April, 1951.

4.—PINEAPPLE.

191. With the appointment of an additional Botanist to the establishment, commencement of botanical work on this crop has become possible and now only awaits development of the pineapple research stations in Johore and Selangor. Meanwhile, assistance has been given with agronomic and manurial experiments in progress on neighbouring commercial plantations, which will be reported on elsewhere.

192. A preliminary field survey of variation in pineapples has been commenced, and initial steps have been taken towards assembling a representative collection of varieties and types.

PESTS AND DISEASES.

193. Pests and diseases of pineapples are the subjects of investigations. There are strong indications that good drainage and cultivation will effect control of much of the disease.

5.—CACAO.

(i) GENERAL.

194. Comparative trials of local Trinitario and imported Amelonado at various localities suggest that certain local selections are superior in vegetative vigour to the Amelonado which is in turn superior to the seedlings from unselected local Trinitario trees. These trials are providing useful agronomic information; some are doing well and some poorly according to local variation in edaphic, ecological and cultural factors.

195. Owing to limited genetic range of locally available material an active policy of importation has been continued. Although conditions for successful establishment of cacao in Malaya are only now being determined, most of the imported material has survived and much is growing well.

(ii) PULAU TEKONG ISOLATION STATION.

196. An isolation and quarantine station was established on Pulau Tekong, a small island off Singapore, where all introductions of cacao and other plants are examined for evidence of disease and pests before introduction to Malaya.

(iii) AMELONADO.

197. Imported (1949) West African Amelonado in Field 44 at the Federal Experiment Station, Serdang, showed initial vigour, jorquetting at the end of 1950 at 5 ft., but has since suffered scorch and die-back due to inadequate secondary shade; material planted in secondary jungle is healthier but is growing more slowly. A few pods have already been harvested.

198. Five pods of Amelonado (ex West Africa) were imported from an experiment station in Macassar.

199. With a view to rapid propagation of material for distribution to smallholders, a programme of multiplication by seed, cuttings and buddings, was commenced at the end of 1951 for the establishment, during 1952, of Amelonado seed gardens in each State and Settlement of the Federation. By the end of the year, a start had already been made with nearly 1,000 buddings at agricultural stations in Malacca and Perak, with a 70 per cent. expectation of success.

Cuttings (260) had also been established at the Federal Experiment Station, Jerangau, in Trengganu.

(iv) TRINITARIO.

200. (a) *Selection*.—Selection work was continued throughout 1950 and 1951 on the mature trees at the Federal Experiment Station, Serdang, and at the Agricultural Station, Cheras, Selangor, but even the best trees have poor dry-weight recovery of beans which are themselves small. This local Trinitario material is, therefore, of no great value.

201. The same has proved true of other, Ceylon imported, seedlings, and reliance must be placed mainly on recent importations from the West African Cacao Research Institute and elsewhere for stocks of improved planting material in Malaya.

202. (b) *Clonal Trials*.—The first clonal trial of local selections planted in November, 1949, is well established and several cuttings are in bearing. Height records show marked differences in vigour of clones.

203. A second and major clonal trial of local selections has proved disappointing. Three blocks were planted in November, 1950, and the remaining two in May, 1951; extensive supplying was carried out in November, 1951, but even now the plants are not well established. The chief troubles have been inadequate shade and extensive insect damage.

204. Observational blocks of clonal material have been planted under various types of shade at Serdang and are doing well. Similar blocks have been planted on two estates, and arrangements for further plantings are in hand. The purpose is to compare performance of similar genetic material under various ecological and soil conditions.

205. (c) *Progeny Trials*.—A trial to compare 16 legitimate progenies of selected trees at Serdang and Cheras has been planted. Tapioca is being used for shade and is proving satisfactory.

206. (d) *Imported Seedling Populations*.—The number of Trinitario plants imported during 1950 and 1951 and established at the Federal Experiment Station, Serdang, is as follows:

1. From West Africa	...	...	...	451 seedlings.
2. From Asia	...	...	...	895 ..
3. Of West Indian (I.C.S.) origin	...	...	...	161 ..
4. From the South Pacific	...	...	...	357 ..

207. Growth records are being maintained on these Trinitario progenies. None of them is yet fruiting but flowering has commenced in some of the I.C.S. 1. seedlings received *via* Kew.

208. Budded clones of the best seedlings are being established for multiplication.

(v) CRIOLLO.

209. Criollo type cacao trees, growing on smallholdings throughout the western States from Perlis to Johore, were inspected, with the co-operation of the State Agricultural Officers. The origin of certain of these trees was established as imports from Ceylon, Java, Sumatra, and Borneo. A white-flowered, green-podded type was found in Malacca and Borneo. Over 80 trees were chosen as the best representatives of the Criollo type growing in Malaya. Budwood from 62 of these trees has been transferred to about 500 stocks in Field 45 at the Federal Experiment Station, Serdang. Seed pods from 54 of the trees have been obtained and illegitimate progeny are being planted in Field 43 for comparative trials.

210. The illegitimate Criollo progeny trial has been established under oil palm at Serdang, but after a promising start the plants are now making little progress. Should uneven growth necessitate abandonment as a trial, this area will be used as a source of pure Criollo seed.

211. In a second trial, which has been established under secondary jungle to compare Criollo and Trinitario selections, growth is good. The Trinitario is so far appearing the more vigorous.

(vi) BUDDING.

212. Investigations are continuing, but it is tentatively concluded from observations that the most satisfactory stocks are Trinitario with a diameter of $3/4$ to 1 in. growing in the field. Basketed stocks present difficulties and Criollo stocks appear less satisfactory. Stocks over 1 in. in diameter are difficult to bud owing to the thickness of the bark and the difficulty of bending over and staking down. Vigorously growing stocks are essential.

213. A note on budding technique has been prepared for Departmental use.

214. Under favourable conditions, results are satisfactory, some 80 per cent. developing into good plants.

(vii) CUTTINGS.

215. Progress with development of technique for establishing cuttings has been disappointing owing to difficulties with watering equipment and insufficient vigour of the parental material. Remedial measures have been taken, with evidence of success.

216. Various rooting media have been tried. Sawdust, while proving satisfactory in the Trinidad type propagator, becomes waterlogged in the open air continuous spray propagators and can only be used once. Coir dust behaves similarly. A mixture of sand and coir dust is proving promising in the open air propagator.

217. Open air propagators proved unsatisfactory for hardening cuttings, nor is hardening easy in closed bins. Various modifications of technique are being tried.

(viii) FERMENTATION.

218. Some preliminary fermentation and drying trials have been carried out and a Departmental pamphlet has been prepared for publication, giving recommendations of method to suit local conditions.

(ix) CACAO INSECT PESTS.

219. Night flying chafer beetles (*Apogonia* spp. and others) are a serious menace to the establishment of young cacao unless control measures are taken.

220. Tests with B.H.C., D.D.T. parathion, chlorinated camphene, and lead arsenate were carried out at Sungei Buloh and the most effective treatments were with a 0.4 per cent. lead arsenate spray and a 0.1 per cent. D.D.T. spray. *Apogonia* grubs live in the ground and insecticidal spray treatments of the soil in cacao plots are in progress as a possible means of control of the grubs and the adults at time of emergence from the soil.

221. Routine control measures with B.H.C. dust were carried out against *Helopeltis theobromae* Miller at Cheras Agricultural Station, Selangor. Dusting at intervals of not more than six weeks was found to be effective.

222. The red coffee borer, the larva of the Cossid *Zeuzera coffeae* Nietn., has been reported attacking branches, and sometimes the trunk, of cacao. It occurs throughout the Peninsula and attacks a variety of trees and shrubs. Control is normally effected by injecting from 0.5 to 1.0 c.c. orthodichlorobenzene or a pyrethrum solution.

223. The Eumolpid beetle *Phytorus dilatatus* Jac. and caterpillars of the Limacodid moth *Setora nitens* Walk. were recorded damaging leaves of cacao in Perak. The Hepialid moth, probably *Phassus damor* Moore, did damage to collars of trees.

224. *Biological control of mealy bugs.* Mealy bugs are proving a pest of some importance to cacao by attacking the apical shoots, which become stunted. The fungus *Aspergillus parasiticus*, which was imported from West Africa with the object of controlling mealy bugs, was given preliminary tests on cacao plants infested with coccids and in test tubes of culture media on which the fungus was growing and into which the insects were introduced. The results in the laboratory were promising but in the field no control was obtained.

(x) CACAO DISEASES.

225. (a) *Suspected Virus Diseases.*—Plants showing symptoms resembling those caused by virus diseases in other parts of the world have been tested to discover whether virus diseases are present in Malaya. Methods used involved budgrafting and transmission of coccids from the suspected plant to healthy seedlings or to skinned beans. In no case did unusual symptoms appear on the test plants.

226. (b) *Diseases Caused by Phytophthora spp. and Pythium complectens.* No species of *Phytophthora* has so far been recorded as attacking cacao under natural conditions in Malaya. Tests were

carried out to discover whether any species of this genus occurring locally was capable of injuring cacao. Three species were used—*P. Palmivora* and *P. heveae* from black stripe of rubber and *P. parasitica* from foot rot of tomato. On stems, *P. Palmivora* produced a cankered patch in the cortex and mycelium penetrated into the wood and pith in 10 days. The other species did not penetrate beyond the point of inoculation.

227. It seems probable, therefore, that the strain of *P. Palmivora* which attacks rubber will in future occur on cacao pods and stems, when the area under cacao increases.

228. *Pythium complectens* was isolated from the decayed tap root of a seedling growing in badly drained soil. The fungus in culture was unable to attack the root, collar or stem of the healthy plants, but on a pod, kept in a damp chamber, a brown rot developed round the point of inoculation. It is not thought, however, that this fungus is likely to damage cacao.

229. (c) *Pod Rots*.—The commonest cause of naturally occurring pod rot has been *Botryodiplodia theobromae*. Other fungi occasionally associated with pod rot are *Colletotrichum* sp., *Fusarium* sp. and *Nectria* sp.

230. The fungus *Nectria* has been identified on pods injured by rats and squirrels, and this might spread to insect damaged twigs.

231. (d) *Sun-scorch*.—Several cases of sun-scorch of the stem followed by *Diplodia* die-back occurred, usually caused by too quick removal of shade. Another symptom of damage due to lack of shade was seen in Amelonado plants which had produced side branches outside their temporary palm leaf shelters. These exposed branches dropped their leaves, afterwards producing numerous short shoots with very small leaves.

232. (e) *Xylaria thwaitesii*.—This fungus appeared in the vicinity of dead Trinitario plants growing in thinned jungle. When introduced on to healthy seedlings it did not attack them and does not appear to have been connected with the death of the original plants.

233. Diseases of cacao from experimental plantings on estates and from Agricultural Stations were investigated. Root disease due to *Fomes lignosus* has been troublesome in young plantings, and *Ganoderma pseudoferreum* caused losses on the old established Trinitario trees on Agricultural Stations. Thread blight and "Red Rust" (due to the Alga *Cephaleuros*) have also been recorded on the stems.

6. TEA.

(i) SELECTION.

234. Preliminary field selections of highland tea at Cameron Highlands have been completed and the next stage of selection will be based on the results of rooting trials commenced in November, 1951. It is intended to test up to 200 cuttings from each of the 264 primary selections. So far 19,856 cuttings have been taken from 224 of these bushes and a second series of cuttings will be planted early in 1952. It is proposed to follow

up this stage by a replicated clonal trial to select for yield and quality. A similar trial with lowland tea at Serdang is also projected.

(ii) BLISTER BLIGHT DISEASE.

235. Blister Blight caused by the fungus *Exobasidium vexans* appeared for the first time in Malaya in February, 1950. This blight has now become established on all tea estates and holdings at Cameron Highlands and occasionally occurs on lowland tea during wet, cold periods. The fungus can cause extensive damage to tea, and its arrival in Malaya is a major misfortune for the highland tea industry.

236. The records to-date show that at Cameron Highlands there are two peak periods for the disease—April to June and October to December. During the middle of the year, July to September, the weather, if normal, should be unfavourable to the fungus and it has been advised that pruning, when undertaken, should be timed so that the new growth is produced during this short off-season.

237. Experimental work and observations have continued throughout 1951 at Cameron Highlands. Bushes recovering from pruning are liable to be damaged to some extent at all times of the year, although, in general, the effects are more serious between October and December and April and May. Bushes in plucking sustain little damage except in the wet weather at the end of the year.

238. A spraying trial to compare different fungicides confirmed that copper sprays give good control. The copper sprays were used at a concentration giving a copper content of 0.125 per cent. and at the rate of 12 to 18 galls. per acre. In another spraying experiment, Perenox was used at normal (0.25 per cent.) and half strength, alone, and with the addition of Lissapol (0.05 per cent.) or Albolineum (0.5 per cent.). This trial indicated that to normal-strength Perenox, addition of these "spreader" substances did not give significantly increased control, but that to half-strength Perenox, the addition of Lissapol gave improved control, results being as good as with normal strength Perenox.

(iii) TEA FERMENTATION AND COPPER STATUS INVESTIGATION.

239. It is known that the principal enzyme concerned in the fermentation of tea is a polyphenol oxidase of the copper-protein type and that well known brands of Ceylon and Indian tea have generally a higher copper content than the local tea. A certain degree of under-fermentation of Serdang tea was suspected which led to investigation on the copper status of tea leaf from bushes growing in the Federal Experiment Station, Serdang.

240. The experiment has now been in progress for more than two years and it is concluded from the results that it is possible to increase the copper content of the leaf by spraying the soil around the bush with a copper sulphate solution. The increase is small and begins to fall off after reaching a maximum about six weeks after spraying. Investigations are being continued on the effects on fermentation.

7.—COFFEE.

(i) VARIETY OBSERVATIONS.

241. Varieties growing at the Federal Experiment Station, Serdang, include Liberian, Uganda, Excelsa and two Java hybrids—Kawisari and Kalimas. The bushes are still young, and though the hybrids and Uganda are fairly vigorous, yields are not yet good. Agronomic experiments are in progress, but it has not been possible to initiate any selection and breeding owing to staff shortage.

(ii) DISEASE.

242. Plants in a nursery were attacked and killed by *Sclerotium rolfsii*. This is the first record of this soil fungus on coffee in Malaya.

8.—FIBRES.

(A) Ramie.

(i) CLONAL COLLECTIONS AND OBSERVATIONS.

243. The large collection of 130 selected clones from local sources, from Java and Florida clones, and from Taiwan, Australian and Jamaican seed were grown at the Federal Experiment Station, Serdang.

244. A preliminary yield trial of 16 selected clones has given significant results at Serdang. Arrangements are being made for trial of the best six of these at several different localities. Work on fibre extraction rates and strength awaits the arrival of equipment now on order.

(ii) DISEASES.

245. An experiment to test susceptibility to certain root disease fungi, showed that ramie is attacked by *Fomes noxius* and *Fomes lignosus*, but has not been attacked by *Ganoderma pseudoferreum* in the experimental plot.

(B) Manila Hemp.

(i) CLONAL SELECTION AND OBSERVATION.

246. Identification of clonal stocks at the Federal Experiment Station, Port Swettenham, was completed. Isolation of possible aberrant types was continued at the Agricultural Station, Temerloh.

247. Trials at the Federal Experiment Station, Serdang, present evidence that the varieties Bangulanon and Tangongan are superior to Baguisanon and Serdang varieties.

248. Good growth of these varieties has been obtained on an estate in Pahang, and samples of Manila hemp fibre from an estate in Johore were of good appearance and tensile strength.

(ii) VIRUS DISEASE.

249. Suckers taken from backward plants suspected of being affected by bunchy top virus were planted in light, well-drained soil and supplied with compost. New growth appears to be normal and no symptoms of virus attack have been recognised.

250. Seedlings grown in insect-proof cages were colonised with aphids (*Pentalonia nigronervosa* Coq.) which had fed on plants considered to be affected with the virus, but no symptoms of the disease developed.

(C) Jute.

251. Jute (*Corchorus capsularis*) was grown on muck soil in Selangor with manure; it grew to a height of 6 ft. but branched and flowered continuously from an early age, probably due to high local temperatures. Retting experiments were made, indicating that the best yield was 840 lbs. per acre. Fibre samples from Kelantan have been below standard quality.

9.—LEGUME GROUND COVERS, GREEN MANURES AND FODDERS.

(i) SELECTION (CLOVERS).

252. Several varieties of white clover (*Trifolium repens*) have been imported and tested at the Agricultural Station, Cameron Highlands, principally as ground covers for young tea. New Zealand pedigree types have proved the most vigorous, and provide most of the many selections which have been planted in observation plots. Pathfinder has provided a number of dense, low, fine-leaved plants; Aberystwyth S100 several sturdy types; and Duron a few but vigorous dark-leaved strains. Dutch White, as expected, was strong and leafy in the first season's growth but is now fading out. A few of the more persistent strains have, however, been transferred to the selection series. Ladino clover of an earlier introduction has not survived, except in patches of moist, good soil.

253. Some persistent, leafy, selections of *Trifolium pratense* have been made. *Trifolium subterraneum* has been a failure.

254. *Trifolium fragiferum* (3 strains) from Australia and New Zealand, *T. studenerii* and *T. johnstoni* from Kenya, *Lotus major* and other spp., and *Ornithopus sativus* have also been introduced for trials at Cameron Highlands.

255. Other legume introductions have been *Stylosanthes gracilis*, *S. mucronata* (Sundaica), *Indigofera dosua* var. *tomentosa*, *I. teysmanni*, *Aeschynomene americana*, *Crotalaria juncea*, and *Sesbania speciosa*.

10.—PASTURE AND FODDER GRASSES.

(A) Pasture.

256. Daily measurements were recorded of soil temperatures at a depth of $1\frac{1}{2}$ inches in *Axonopus* grassland under light shade of trees, and in full sun. Maximum temperatures in shaded ground varied between 78.8° and 84.6°F., and in full sun, between 85.7° and 93.5°F. These differences in soil temperatures seem to be the basic factor in better growth of grass in shaded conditions.

(B) Fodder Grasses.

257. The best fodder grasses continue to be Guinea grass, Napier grass and Guatemala grass (*Tripsacum laxum*).

258. Introductions of hybrid Napier x Sorghum selections were made from Hawaii, but they were found to have a rather spreading habit of growth, and yields were not as good as ordinary Napier grass in this climate.

259. The analysis of fodder grasses from the manurial experiments at the Federal Experiment Station, Serdang, has been continued.

260. In the Guinea grass experiment, the samples from the plots manured at the rate of 8 and 10 cwts. of sulphate of ammonia per acre were consistently higher in protein than those from the plots with smaller applications of fertiliser, and remained so for a month after manuring.

261. The Napier grass experiment showed that it would be possible to increase the protein content up to 17 per cent. on a moisture-free basis by means of a heavy dressing (20 cwts. per acre) of ammonium sulphate.

11.—FOODCROPS.

(A).—*Soya Bean*.

(i) VARIETY SELECTION AND TRIALS.

262. Soya beans are one of the most valuable of food crops, and it was proposed to adopt local selections for use in off-season dry cultivation of padi fields.

263. During the period 1947 to 1949, single plant selections were made from a widely collected foundation stock of varieties of soya beans, and in 1950 and 1951, selected strains were tested in field trials at the Federal Experiment Station, Serdang.

264. In the first trial in the Serdang General Nursery, 29 strains yielded at rates of between 1,200 and 1,600 lbs. per acre. In the second trial, in Field 14, seven strains gave yields varying between 560 and 620 lbs. per acre.

265. There was little adverse result from damage by *Melanagromyza* stem-borer in these variety trials, but pod-borer (*Aracerus*) damage in the second trial was extensive, so that yields were rather low and very variable, and show no significant superiority of varieties.

266. Single plant selection of two additional Java varieties is also in progress. Selected strains of one of these varieties give promise of being superior in yield to any of the earlier (1949) series.

(B).—*Groundnut*.

267. A foundation stock of 15 collections of local groundnut strains has been planted for carrying out single plant selection. This work has had to be deferred owing to staff shortages and stocks are being maintained.

268. Selected strains from Sierra Leone and Java have also been tested, and one of those from Java appears very well suited to local conditions.

(C).—*Sweet Potato.*

269. The collection of sweet potato varieties has been maintained, though little progress has been made with botanical studies owing to pressure of other work. It is proposed to select varieties in this collection giving high yield of tops.

(D).—*Maize.*

270. Severe attacks of *Helminthosporium turcicum* leaf spot occurred on imported maize varieties at the Federal Experiment Station, Serdang. Stems were also affected. Rust (*Puccinia sorghi*) was also prevalent.

12.—SPICES.

(A).—*Cloves.*

271. The insecticide Dieldrin was found to give a good kill of adults of the two clove boring beetles *Aphrodisium brevicorne* Franz and *Niræus tricolor* Newm. when they were allowed to rest on bark which had been sprayed with an emulsion containing 1.2 per cent. of actual toxicant. After five minutes contact all beetles were paralysed within 24 hours and there was no recovery. Although the concentration used was considerably in excess of that normally used against other pests, this insecticide is the only one tested which has shown promise. At less than 1.2 per cent. the kill rapidly dropped off. Field trials will be carried out when supplies of this insecticide are available, but the question of health hazards to humans will require careful investigation before Dieldrin can be accepted for use on any edible crop.

13.—VEGETABLES.

272. A large number of varieties of market-garden vegetables were grown in trials at the Agricultural Station, Cameron Highlands (4,750 ft.) and disease problems have been investigated by the Plant Pathology Division.

273. Leaf blight (*Alternaria dauci*) of carrots, and anthracnose (*Colletotrichum lindemuthianum*) of French beans were well controlled by weekly spraying with Bordeaux mixture or "Perenox".

274. Diseases of potatoes, tomatoes, cabbages, several Chinese brassicas, lettuce and celery were also studied.

14.—MISCELLANEOUS FRUITS.

Banana.

275. A collection of local varieties has been maintained and added to, and clonal material of selected varieties has been supplied for agronomic experiments.

276. Panama disease (*Fusarium oxysporium* f. *cubense*) continued to cause damage to plants used as primary shade for cacao. *Pisang kelat* appears to be very susceptible, as is the commonly planted *Pisang embun*.

15.—DERRIS.

277. Work on the selection of high grade planting material was continued.

16.—SOIL INVESTIGATIONS.

(i) SOIL FERTILITY.

278. As yet, no satisfactory method has been evolved for the determination of "available" phosphate and potash in Malayan soils, and it would appear that the only really reliable system would be a method using a plant as an indicator. A large number of samples, both alluvial and upland soils, have been examined by the Neubauer method using padi seedlings. This method shows promise for the determination of potash, especially in alluvial soils.

279. Another approach to the problem of the measurement of soil fertility in the laboratory is the determination of the conductivity of soil suspensions, both immediately after shaking and then after allowing the suspension to stand for seven days. Measurements have been carried out on both upland and swamp soils. An interesting feature of these results was the large number of swamp soils having a value above 150 (mhos $\times 10^6$). Many of the samples had values of over 200 which, according to Hardy, shows the presence of abnormal salts. It is doubtful whether this method will be of use as a measure of soil fertility but it is extremely useful for the detection of abnormal soils and it can be employed as a routine measurement on alluvial soils for the detection of abnormal salt content.

(ii) ORGANIC MATTER IN SOILS.

280. Organic matter has been determined in a number of soil samples from land under virgin jungle, under plantation, *belukar* and *lalang*. The organic matter was determined by Robinson's hydrogen peroxide method and by the Walkley-Black carbon method. To serve as a check on the titration method of Walkley-Black, the carbon in several samples was determined by dry combustion, and it was found that the percentage recovery by titration averaged about 80 per cent. It was shown that not all virgin soils are high in organic matter. It was found that the nitrogen content of virgin jungle soils was considerably higher than in degraded soils, though there were some exceptions; the high nitrogen content would appear to be one of the factors stimulating growth when virgin jungle is felled and planted.

(iii) SOIL SURVEYS.

(a) Padi Areas.

281. *Trans-Perak*.—During 1950 to 1951, extended sampling of soil was carried on over 45,000 acres of the Trans-Perak River padi irrigation scheme area, and results show that while in the north (Raja Hitam Forest Reserve) there are extensive areas of clay soil, there are about 8,000 acres of deep peat, of more than 3 ft. in depth, occurring mostly in the south.

282. Towards the west and centre of the projected irrigation scheme, too, there is peat and muck soil, in many places of over 10 ft. in depth. In such cases, this is covered with a layer of silty material to a depth of 9 to 12 ins., presumably laid down by recent flooding with silt-laden water.

(b) *Other Areas.*

283. Soil sampling and surveys were also carried out at Paya Temai, Kuantan, Pahang, and at Pasir Akar, Besut, Trengganu. The Paya Temai survey for 12 miles along the river shows clay soil for 80 to 100 chains from the river bank and then deep peaty swamp for a greater distance further in. The Pasir Akar survey (over 2,000 acres) for a new irrigation scheme, showed a uniform clay alluvium.

284. *Jerangau, Trengganu*.—Two blocks, each of 100 acres, near Jerangau, were surveyed with the intention of establishing an Agricultural Station on the finer grained granite soils. During the survey, it was found that these fine grained granites were not as extensive as was at first believed and that they appeared to occur in veins and ridges running through the coarser-grained granites.

285. *Jerantut, Pahang*.—An area in the vicinity of the 104th milestone Jerantut-Kuantan Road was visited with a view to establishing a station on volcanic soil. Indications of volcanic soil were found but detailed examination must await more peaceful conditions.

286. *Gajah Mati, Kedah*.—A survey of an area of 400 acres at Gajah Mati, Kedah, for the establishment of a Federal Experiment Station was carried out. The soil was classified as Malacca series, i.e., soil profiles with a layer of concretionary laterite near the surface. Examination of roadside profiles of the soils of North Kedah revealed that the soils of the Station were typical of many of the soils of this part of Kedah.

287. *Endau, Johore*.—An area near Endau, where it is proposed to reserve land for *kampong* development, was also visited and the area was found to consist mainly of a medium-grained granite soil.

288. *Rembau, Negri Sembilan*.—A soil map of the Agricultural Station, Rembau, Negri Sembilan, was prepared.

(iv) CALCIUM.

289. Calcium determinations on soil, from a Guinea grass trial at Serdang which is receiving heavy dressings of sulphate of ammonia, have been carried out. So far, the heavy dressings of sulphate of ammonia do not appear to have caused any significant loss of calcium from the soil.

(v) MULCHING EFFECTS.

290. Monthly examinations of a soil under two types of mulch (saw dust and padi husk) in the Federal Experiment Station, Kuala Lumpur, have been carried out over a period of nine months. Determinations include pH, moisture content at sampling, water holding capacity and stability, aggregate analyses, organic matter content and nitrogen content.

(vi) PEAT INVESTIGATIONS.

291. A visit was made to the Pontian area of Johore to examine the peats there and compare them with the Selangor and Perak peats. Examination of a profile did not reveal any outstanding differences from the other peats, and the Pontian

peats appeared to be formed under similar conditions, i.e., they are forest peats. Chemical examination also showed that they were very similar to the other peats. Samples analysed by fractionation showed that peats from Pontian were similar to those from Selangor.

292. Laboratory examinations and pot experiments have been continued to study the effects of lime, N.P.K. dressings, and copper sulphate on peat, and growth of plants in peat.

293. The pot experiments showed that lime was essential for the growth of maize, soya beans and tomatoes on peat. The lime was added as burnt lime.

294. Liming at rates of 5, 10 and 20 tons per acre caused a considerable decrease in the amount of ammonia-soluble fraction in the peat but resulted in a relative increase in the percentage of lignin. The alcohol-soluble fraction in the heavily limed pots decreased to half its original amount.

295. In another experiment, with ramie, liming and the burning of the top peat both gave better results than adding the burnt peat ash, which indicates that the effect of burning peat is beneficial more than by its residue of ash alone.

17.—CANNING RESEARCH.

(i) REHABILITATION AND EQUIPMENT.

296. The Canning Officer assumed duty in May, 1950, and completed the rehabilitation of the Canning Research Station, Johore Bahru, with equipment awaiting installation and equipment that continued to arrive.

297. In the Cannery, complete pilot plant, quick-freezing equipment has been installed and put into working order. This equipment has been given a test-run with pineapple in syrup and has been found suitable for research purposes. However, a major difficulty has been encountered in the unreliable nature of the main power supply, which must be improved before successful freezing experiments can be carried out.

298. The bacteriological equipment is now complete, and available analytical procedures have been considerably extended, particularly in the field of sugar estimations. The scope of the laboratories has been increased, but their capacity is still limited by inadequate staff.

(ii) INSPECTION AND GRADING OF CANNED PINEAPPLE.

299. A new grading scheme was approved by the packers for trial in the 1950-51 winter season, and at the end of the year satisfactory progress was evident. The three monthly summaries available showed an improvement in the samples, and the success of one cannery in meeting the new specifications in this first season confirmed the practical working possibilities of the scheme.

300. During this trial period, a very close liaison has been maintained with the canners and many sample examinations have been carried out in their presence. The result has been

a general awareness of the necessity to improve packing standards, and there have been no serious cases of dispute over the results published by the Station.

301. A modified and extended grading scheme was developed and put into effect experimentally in the peak season May to August, 1951. It is estimated that more than 90 per cent. of the Malayan Pineapple pack was sampled and examined.

302. The average percentage of marks for quality and other commercial factors, gained by the industry as a whole was approximately 50 per cent. higher than in the previous season, and it was obvious that, where a canner was actively co-operating in the maintenance of quality and processing standards, great strides forward were made.

303. Preparation and testing of crushed pineapple in cans were carried out to a considerable extent early in the year for the extension of the grading scheme.

(iii) PINEAPPLE BY-PRODUCTS.

304. Following the results of fruit analyses carried out in the course of experiments, it has been possible to form a clearer picture of economic possibilities in the recovery of by-products. The only immediate prospect is the preparation of cattle feed from waste. Small trial samples of dried bran have already been prepared under controlled conditions. Studies have been carried out of composition and keeping qualities.

(iv) CONTAINERS.

305. At the request of the Metal Box Co. Ltd., the Canning Officer participated in a large-scale trial of packing with new type cans prepared by the Research Division of that organisation. These trials are designed to investigate the resistance of substitute tin-plates, with and without lacquer protection, to the corrosive substances present in canned pineapples.

(v) MISCELLANEOUS.

306. Small trials and observations on a number of subjects were carried out. Among them were:

- (a) Canned fruit output from Sarawak Pineapple.
- (b) Variation of acidity of canned pineapple from foreign and domestic sources.
- (c) Results of controlling acidity of canned Singapore Spanish pineapple to match Smooth Cayenne, and its effect on flavour.
- (d) The determination of total solids in pineapple products.
- (e) The effect of fruit maturity as measured by skin colour on the output of graded pineapple products.

(vi) ADVICE TO PACKERS.

307. Apart from serving on the Pineapple Provisional Working Party, the Canning Officer has undertaken considerable advisory work on behalf of the industry.

C. AGRONOMIC INVESTIGATIONS.

1.—CROPS.

(A).—*Padi*.

(i) WET PADI.

308. Mechanical cultivation experiments were carried out in four main localities, one on peat, two on heavy alluvial clays and one on a sandy clay. The Russell-Hawkins report, received in February, 1950, suggested that certain investigations should be carried out on the mechanical cultivation of peat soils. These investigations were undertaken in 1950 and concluded in 1951. It became evident that the problem was even more difficult than appeared at first sight and that there was little chance of evolving economic techniques for its solution. Consequently further work on the mechanical cultivation of peat soils ceased.

309. In general it has been found that the clay soils can be cultivated successfully by plough and disc-harrow when dry, or by plough and roll when wet. Progress has also been made with seeding trials by drilling on dry soil and broadcasting on water. Drilling in suitable weather conditions presents no real problem and the old-fashioned fiddle type of hand-broadcaster has given very good broadcasting results.

310. A technique of weed-control by herbicide dusting has been evolved at one locality, but the method is very expensive and further investigations are required.

311. Harvesting trials with reaper-binders, combine-harvesters and a simple header have been carried out with somewhat disappointing results, largely owing to the uncertainty of the weather at harvest. Further progress depends on the importation or construction of new types of machines.

312. Cultural field trials have been carried out at three localities but they have all been subject to high experimental errors. In the 1949-50 season, the only clear-cut result obtained was the marked superiority, in Kelantan, of wet cultivation over dry cultivation. Since that season there has been a marked shift of emphasis, in field investigations, from cultural to manurial trials, as the latter were beginning to give clear-cut results.

313. Manurial trials in the 1949-50 season have been described briefly in a paper in the *Malayan Agricultural Journal* of January, 1951. The most important result was obtained from a time-of-application placement trial in Kelantan, using mono-ammonium phosphate at 300 lbs. per acre. This dressing applied 6 to 10 weeks after transplanting gave a 50 per cent. increase in yield of grain over control.

314. There was one other result of significance, namely, a yield increase of 70 to 100 per cent. as a result of the application of three types of phosphatic manure to wet padi growing on well-drained granite wash soil. An important negative result was the failure of large dressings of two types of rock phosphate to give yield responses.

315. In the 1950-51 season, manurial investigations were expanded and some 107 field trials were laid down all over the country. Analysis of yields has not yet been completed but notable results may be summarized below:

- (a) The almost invariably significant response to fertilisers of wet padi on the well-drained sandy clays of the north-east States of Kelantan and Trengganu. The most marked responses were obtained from nitrogen in the presence of soluble phosphates. Responses to potash were also obtained but they were most marked in the presence of the other two nutrients.
- (b) In a series of five experiments in Perak, Province Wellesley and Penang, placement applications, one month after transplanting, of urea, nitrate of soda and sulphate of ammonia in the presence of rock phosphate gave yield responses to urea and nitrate of soda in two experiments and to urea and sulphate of ammonia in a third trial. Phosphate alone gave no response.
- (c) In a placement experiment in Malacca, rock phosphate, broadcast or placed in a band between plant rows, gave a yield response in the second year of the trial, but pocket placements close to the plants failed to give any response. The rate of application was equivalent to 200 lbs. P_2O_5 per acre.
- (d) Where a response was obtained from the placement of fertilisers on the rich soils of the west coast it was usually to a combined application of nitrogen and soluble phosphate. The best single fertiliser was ammonium phosphate but, in perhaps half the experiments, a combination of sulphate of ammonia and superphosphate was equally good. In a few interesting cases sulphate of ammonia proved to be an unsuitable form of nitrogen.

316. In the 1951-52 season, manurial investigations were greatly expanded and a whole series of new, carefully-planned trials were initiated. Observations during growth have indicated that these trials will yield much valuable information.

(ii) DRY PADJ.

317. Investigations are confined to the two States of Kelantan and Trengganu.

318. Deep ploughing has given a significant response in yield of grain in both the seasons under review, and the cultivation of an off-season arable crop with some manure has been shown to result in higher padi yields in the following season.

319. It is quite clear from manurial trials that, in a normal season, balanced fertiliser dressings give an economic yield response and that all three nutrients in an N.P.K. mixture contribute towards this response. There is, as yet, no evidence that minor elements are required but investigations on this point are continuing.

320. The mechanical cultivation of dry padi presents none of the major problems associated with wet padi, and investigations in this direction have been expanded. It is clear that a balanced

fertiliser mixture can be ploughed in before sowing and that a very significant increase in crop results. No differences have been caused by different methods of application.

(B).—*Coconut.*

321. No conclusive results have been obtained from drainage and mechanical cultivation experiments on this crop. There were strong indications, however, that mechanical cultivation on a very sticky coastal clay depressed yield of old palms and that grazing of the cover had the same effect. Neither result was significant at the conventional probability level of five per cent., but treatments were not adequately replicated.

322. Two of these experiments were discontinued at the end of 1951, when the Federal Experiment Station, Port Swettenham, was closed.

323. An intercultivation experiment on a Selangor estate, which was laid down in February, 1950, has so far given negative results. The four treatments were:

C—Control. Weeds controlled by hand slashing.

H—Disc-harrowed whenever necessary.

P—Ploughed once a year and harrowed whenever necessary.

P.D.—Ploughed and ditched once a year and harrowed whenever necessary.

324. A factorial manurial trial on poor inland soil was planted up towards the end of 1951.

(C).—*Oil Palm.*

325. An important replanting and fertiliser experiment was laid down at Serdang between October, 1950, and March, 1951. The main treatments consisted of felling the old palms prior to replanting (control), and felling one, two and three years after interplanting with young seedlings. Felling of old palms has been carried out by a combination of dozing and winching and, so far, damage to young palms has been negligible. Fertiliser sub-treatments have been superimposed, and height measurements, recorded in November, 1951, revealed a highly significant response to nitrogen in the growth of the young palms.

326. An important fertiliser experiment on old palms was laid down on a Selangor estate in July, 1950. The layout is a factorial one with adequate replication. Yields for the first year indicated no responses, but none was expected within this period. Unfortunately security subsequently deteriorated and yields for the all-important second year are not being recorded nor has the annual fertiliser application been repeated.

327. Leaf analyses, carried out by the Research Branch have indicated that the potash-calcium ratio may be of importance, and the potash-phosphate ratio is known to be so. A fertiliser experiment to follow up this research was laid down at Serdang in December, 1951. No important results are likely to be obtained until 1953.

328. Other investigations on this crop consist of unreplicated observations or experiments with inadequate replication. No result of importance can be quoted from these, although there is an indication that fertiliser broadcasting is at least as effective as pocket placement.

(D).—*Pineapple.*

329. Because this important crop is threatened by falling yields and an increased incidence of disease, agronomic investigations have been intensified during late 1950 and 1951. Most of these trials are in the Pontian area of Johore but there is one well-designed experiment in Selangor where the crop is inter-cultivated with young rubber. Interim results from experiments may be summarized as follows:

- (a) Potash is the all important nutrient and leads to more healthy growth and an increased yield. The serious disease known as green wilt is associated with a low potash-phosphate ratio.
- (b) A late application of a balanced fertiliser applied five months before harvest increased fruit size in one trial without affecting total yield by weight.
- (c) Date of harvesting can be controlled by spraying with a dilute solution of alpha-naphthalene-acetic acid.
- (d) There is some evidence, largely from observation, that control of at least some diseases depends on improving conditions of growth by methods such as planting on ridges and improving drainage.
- (e) Selection of healthy planting material is important.

(E).—*Cacao.*

330. The number of agronomic experiments on this potentially major crop is exceeded only by that of wet padi trials. Since the existing staff is inadequate to carry out these investigations, the majority depend on co-operation with estates. Such co-operation has been very successful.

331. The number of co-operative trials in progress at the end of 1951 is summarised below:

Establishment + spacing trials	...	...	...	24
Variety trials	...	...	...	3
Spacing trials with old rubber	...	...	...	4
„ „ young rubber	...	...	...	7
Trials with coconuts	...	...	...	3
„ oil palms	...	...	...	2
„ Manila hemp	...	...	...	1
Manurial trial	...	...	...	1
Total				45

In addition there were 25 experiments in progress on Agricultural Stations.

332. Interim conclusions from these investigations may be summarized as follows:

- (a) The establishment of healthy secondary shade, before planting cacao, is all important. Bananas have proved to be a suitable shade only on the richer soils.
- (b) *Erythrina subumbrans* and *Gliricidia sepium* are suitable species for use by estates. The former is the quicker grower but a mixture of the two species would be more advisable than the use of one species.
- (c) Leguminous bush covers have proved to be too competitive for use in young cacao clearings.
- (d) Both tapioca and aroids, *e.g.*, *Colocasia* and *Xanthosoma*, are very liable to attack by wild pig. The former has, however, proved useful where quick shade is required.
- (e) Early growth of cacao under thinned jungle has been excellent in some localities, but too thick a stand of jungle trees is harmful. A stand of 140 trees per acre appears to be too heavy; that of 70 may be about correct at first but will probably require progressive thinning.
- (f) Damage by leaf-eating beetles is negligible under jungle shade but usually serious under cultivated secondary shade. In one locality damage by grasshoppers was more serious under jungle than under *bělukar** shade.
- (g) The shade produced by quick growing secondary jungle, which regenerates after jungle felling without a burn, has been associated with very good cacao growth and low cultivation costs.
- (h) Growth on the better drained alluvial clays can be surprisingly good, provided that cacao is protected from drying winds.
- (i) Initial growth of cacao on the laterite soils of the Malacca series is sometimes very good. The maintenance of good growth probably depends on regular applications of fertiliser.
- (j) Growth of cacao on one estate situated on fertile soils of the Segamat series has been very disappointing indeed. This observation must be treated with reserve because the secondary shade of bananas has been subject to severe pest and disease attack.
- (k) Experience at Serdang and in Negri Sembilan indicates that, with good cultivation, it is possible to grow cacao without shade, such trees being very bushy when in bearing. However, trees which start off under shade and later become exposed are very susceptible to sun scorch on the main stem, with subsequent die-back. It would seem, therefore, that it is only possible to grow cacao without shade when the plants themselves shade their own stems.
- (l) In general, cacao under light shade comes into bearing earlier than plants under jungle shade.

* Secondary jungle growth.

(F).—Tea.

333. A lowland tea manurial experiment at Serdang has been in its third and fourth years during the period under review. The treatments were:

N₂ PK—600 lbs. sulphate of ammonia (126 lbs. N) per acre per annum.

N₁ PK—400 lbs. sulphate of ammonia (84 lbs. N) per acre per annum.

N₀ PK—No nitrogen—control.

During the four years of the trial, the N₂ PK dressing has given an average increment over the control of 317 lbs. per acre per annum of made tea for an expenditure on sulphate of ammonia, at present prices, of \$68.50 per acre per annum. The response to the N₁ PK dressing has been proportionately less.

334. Two experiments have been in progress at Serdang which were designed to compare the root growth of cuttings with those of seedlings. Heavy supplying has been necessary in both experiments. It has not been possible to treat casualty figures statistically but there is no indication that cuttings are more difficult to establish than seedlings. There is, however, evidence that tea replanting in the lowlands will be an expensive operation.

335. Tea rooting trials have been in progress at Serdang during the two years under review on 581 selections. There have been many staff and other difficulties and progress has been unsatisfactory. It has now been decided to establish one observation block of each clone, as it is evident that poor rooting ability will eliminate many clones during this process.

336. Pre-treatment yields have been recorded on two experimental sites at Cameron Highlands Agricultural Station. The results were satisfactory on one site and a rate of application of nitrogen experiment was laid down in November, 1950. Errors were made in the fertiliser application and the experiment will recommence in 1952 after pruning.

337. It is planned that the second experimental layout will be a factorial one to study the influence of nitrogen, phosphoric acid and potash. For a number of reasons the recording of pre-treatment yields is still in progress.

(G).—Coffee.

338. In a shade and variety experiment at Serdang there is an indication, in the fourth year, that shade reduces yield of Liberian coffee but does not affect the yield of Uganda coffee. This trend has not yet attained statistical significance. Quantitatively the yields have been disappointing.

339. A pre-war experiment of mulch versus no-mulch on Liberian and Robusta coffee had the treatments reversed in 1947. Recovery of the previously unmulched plots was more rapid in the case of Liberian coffee but Robusta yields eventually followed suit. By the end of 1950, the newly mulched plots were out-yielding the unmulched plots but the difference had not then attained statistical significance. The experiment was then discontinued because mulching operations were proving to be very expensive and shortage of labour had become critical.

(H).—*Tapioca*.

340. Variety and time of harvesting experiments have been conducted at five localities in order to determine whether the best yielding varieties from Serdang repeat these yields and have the same maturation period elsewhere. One trial was destroyed by wild pigs. Of the other four trials, the only results examined to-date reveal that, in Kelantan, the varieties Kekabu and Medan give the highest yields and that harvest at 12 or 14 months from planting gives better yields than at 10 months. Since Kekabu is also the most palatable variety it is the obvious choice for planting by smallholders.

(I).—*Fibres*.

(i) MANILA HEMP.

341. Two co-operative Manila hemp and rubber inter-cultivation experiments were designed for estates, and the first, in Selangor, was planted in December, 1950, and the second, in Johore, in May, 1951. In the first trial, on alluvial clay, considerable damage from wild pig has been reported, but on the other estate growth has been satisfactory.

342. A variety trial on this crop on poor soil at Serdang has given disappointing results and an attempt has been made to improve performance by regular manuring, digging extra drains and liming. The effect of these treatments cannot be looked for until late in 1952.

343. A large drainage and variety trial of Manila hemp was planted on stiff alluvial clay at Port Swettenham in 1950 but growth was very poor and the experiment was discontinued when the Federal Experiment Station concerned was allocated to resettlement at the end of 1951.

(ii) JUTE.

344. During 1950, an observation plot of jute, *Corchorus capsularis*, showed some promise when grown on muck soil on the Selangor coast. In 1951, five spacing experiments were laid down in the padi off-season in different parts of the country, but in all cases, except one, growth was disappointing and associated with very early flowering. The exception was on the Selangor muck soil where growth in height was fair but gross yield of fibre disappointing.

345. In continuation of these investigations a time of planting trial was started in Kuala Lumpur in November, 1951, with a view to determining whether either species of *Corchorus* shows photoperiodism. Monthly plantings will be undertaken for one year.

(iii) ROSELLE.

346. A spacing and management trial of Roselle was carried out in 1951 in two localities in Kelantan. Early growth was slow but the crop finally matured in $8\frac{1}{2}$ months. Watered plots at Kota Bharu grew to a height of 10 ft. and yielded at a rate equivalent to 42,700 lbs. per acre of green matter. A sample fibre extraction indicated an approximate yield of 1,571 lbs. of fibre per acre. Irrigated plots yielded less but this was certainly due to inexperience of the technique. This crop shows some

promise but the maturation period is too long for it to be grown on padi land in the off-season. The optimum spacing would appear to be about $1 \times \frac{1}{2}$ ft.

(iv) RAMIE.

347. Investigations on the cultivation of ramie on peat were commenced in 1950, when it was found that the crop would only grow after the peat had been burnt *in situ*. A 2^4 factorial trial was laid down on the same soil in 1951 in order to study the effects and interactions of peat burning and the application to the soil of ground limestone, organic fertilisers and inorganic fertilisers. Interim observations show that all treatments are beneficial and that nitrogen is the main nutrient requirement for vigorous growth.

(v) MISCELLANEOUS FIBRES.

348. A miscellaneous collection of fibre plants has been under observation at Serdang, and *Phormium tenax* seed has been imported for trials in the highlands.

349. A large experiment on Mauritius hemp, *Furcraea gigantea*, was planned in 1950 but shortage of labour at Serdang has required its postponement.

(J).—Fruits.

(i) BANANAS.

350. A species and variety collection has been maintained at the Federal Experiment Station, Serdang.

351. Observations at two localities have pointed to the beneficial effect of mulches on the growth and yield of bananas. Since availability of mulching material often limits the application of this practice, a mulching trial using padi husk, saw dust and cut grass was laid down in Kuala Lumpur in November, 1950. Harvesting commenced in August, 1951.

352. A factorial manurial trial ($3 \times 3 \times 3$) was designed early in 1951 and was laid down at one locality in Negri Sembilan towards the end of the year using the variety *pisang embun*. The object of this experiment is to determine whether banana cultivation in Malaya can be converted from shifting to permanent cultivation. It is hoped to repeat the trial at other localities as soon as circumstances permit.

353. A small pruning and management trial was laid down in Kuala Lumpur during 1951.

(ii) OTHER FRUITS.

354. Rambutan variety trials are in progress at three localities, and a durian trial at one Station. All three rambutan trials have come into bearing and it is evident that clones vary considerably in their precocity. At Degong, Perak, on alluvial soil, clone R.84 is the most vigorous but it is also the slowest to come into bearing.

355. Precocity may be summarized in the following table:

Locality.	Soil.	Early Bearing Clones.	Late Maturing Clones.
Degong ..	alluvial clay ..	R. 5 and 30	.. R. 84
Ipoh ..	quartzite ..	R. 11, 1, 10, 6	.. R. 84, 133, 7, 81
Serdang ..	quartzite ..	R. 3, 86, 10, 4	.. R. 81, 99, 61, 1

356. In a strawberry variety trial of four imported seedlings, Cambridge 448 gave the best performance in 1950 at Cameron Highlands.

(K).—*Fodder Grasses.*

357. Manurial investigations at Serdang have proved that Guinea grass responds to heavy dressings of potash and nitrogen, the former nutrient being the more important. High nitrogen without potash leads to the death of the plants and there is no indication whatever that phosphate, as super-phosphate, leads to an increase in yield. In this investigation the K_0 , K_1 and K_2 treatments have been changed to K_1 , K_2 and K_3 respectively and the phosphate is now being applied as basic slag.

358. In a variety and manurial trial laid down at the end of 1949, Napier and Guatemala grass out-yielded Guinea grass in 1950 but not in 1951. Differences between manurial treatments were very striking and they indicated that the application of inorganic fertilisers gives a more economic response than heavy dressings of cattle manure, either alone or in combination with inorganic fertilisers. Other manurial investigations have indicated that heavy dressings of nitrogen have a greater effect in increasing the yield of protein than the gross yield of fresh Guinea grass.

359. A variety trial with five strains and hybrids of Napier grass was laid down in 1950 and yield records commenced in August, 1951. So far the local variety has out-yielded all others.

360. An irrigation and manurial trial on Guinea grass was laid down at Serdang in 1951. During the pre-treatment period irrigation was uniform and establishment rapid. Experimental recording commenced in October, 1951.

(L).—*Leguminous Fodders, Green Manures and Cover Crops.*

361. A large number of leguminous herbs, bushes and trees are under observation in different parts of the country. The most promising introduced fodder is probably Stylo, *Stylosanthes gracilis*, as this has been yielding well in Kelantan. Goats find it very palatable but cattle require gradual conditioning. It is also a useful cover crop. Other interesting importations are:

Indigofera Teysmanni

Sesbania speciosa

Aeschynomene americana

Stylosanthes mucronata (= *S. sundaica*).

The search for suitable green manures to grow on padi land in the off-season has continued.

(M).—*Pastures.*

362. In an establishment and shade trial it is clear that the best yields of fresh foliage are obtained where either Guinea grass or the legume *Centrosema pubescens* is included in the initial planting. This holds good even for the third year after planting.

363. In a shade and variety trial, the light-loving *Axonopus affinis* has out-yielded the shade-loving *A. compressus* but there were no significant differences between the shaded and no-shaded plots. The shade trees, *Enterolobium saman*, are slow-growing on the very infertile soil of this site. It is interesting to note that the shaded *A. affinis* plots have been invaded by *A. compressus*.

364. A large 3³ factorial manurial trial with four replications and 108 plots was laid down in 1951 at Serdang, and the first manurial application was given in November, 1951. The N₁P₁K₁ dressing is as follows:

N ₁ 2 cwt.	..	sulphate of ammonia per acre per annum in two dressings
P ₁ 3 cwt.	..	basic slag per acre per annum in two dressings
K ₁ 1 cwt.	..	muriate of potash per acre per annum in two dressings

Unfortunately it is not yet practicable to record yields in terms of live-weight gains of grazing animals.

(N).—*Vegetables and Foodcrops.*

365. During the period under review, 57 variety, manurial and cultural experiments have been laid down at the Federal Experiment Station, Kuala Lumpur, and a smaller number have been carried out at other Federal Experiment Stations. The most important crops under investigations have been as follows:

Maize
Sweet Potatoes
Soya Beans
Groundnuts
Brinjal
Long Beans
French Beans
Chinese Crucifers

(O).—*Miscellaneous Crops.*

366. Two importations of seed of the West African liane *Tetracarpidium conophorum* have been made. Germination of seed and early growth on a variety of living supports has been quite promising and flowering has occurred within one year of sowing. So far no seed has set. This seed yields a drying-oil comparable with linseed oil.

367. A small collection of *Strophanthus* spp. has been made at Kuala Lumpur. Seed of some species has been used to prepare the drug Cortisone. So far only *S. jackianus* has set seed in cultivation.

2.—LIVESTOCK.

(A).—*Goats.*

368. A breeding herd of four imported milch and dual purpose breeds has been established at Serdang.

369. Total milk production from this herd during 1951 was 15,542 lbs. Individual milk records of interest are given below:

Goat No.	No. of days in milk.	Total yield in lbs.	Average yield per day in lbs.
British Alpine 4	365 ..	2,235.6 ..	6.12
British Alpine 5	365 ..	1,569.6 ..	4.30
Toggenburg 6	302 ..	947.5 ..	3.14
Toggenburg 10	354 ..	1,565.6 ..	4.42
$\frac{1}{2}$ bred Togg. 103	208 ..	1,010.2 ..	4.86
$\frac{1}{2}$ bred Togg. 104	284 ..	909.75 ..	3.20
$\frac{1}{2}$ bred Togg. 117	249 ..	1,087.1 ..	4.36
$\frac{1}{2}$ bred Saanan 109	34 ..	200.2 ..	5.90
$\frac{1}{2}$ bred Saanan 111	31 ..	179.75 ..	5.80

It will be seen that the yield of the best animals compares favourably with that from milch cows in the tropics.

370. The herd numbers 24 head of pure breds and 42 head of cross breds.

371. Growth rate observations at two localities show that half-bred animals make greater live-weight gains than local goats.

(B).—Poultry.

372. Feeding and management trials have been in progress at six localities. Early results have been very variable. In some areas R.I.R. birds have easily out-yielded *kampong* birds when fed on balanced rations. However, the reverse would seem to be the rule on *kampong* rations, although *kampong* birds have laid smaller eggs. With regard to the comparison between Agricultural Station and *kampong* management, it would seem that no general conclusion is possible.

(C).—Pigs.

373. Lack of staff has not permitted any major investigations.

374. A small feeding trial has shown that palm kernel cake can be used to replace coconut cake in pig food. This feeding stuff is now being produced in Malaya. A precise feeding trial to test a proprietary nutritional supplement on weaner Middle White pigs was designed in August, 1951, but it was not possible to initiate this until the end of the year.

(D).—Cattle.

375. No investigations have been carried out, although cattle have been used as recording animals in pasture investigations.

376. Two young bulls and ten heifers of Bali cattle, *Bos sondaicus*, were imported in 1951. These are now thriving and a breeding herd will be built up to permit a study of their usefulness in Malayan agriculture.

D. EXTENSION AND ADVISORY WORK.

377. Extension and advisory work are the main functions of the State and Settlement Departments of Agriculture. Since the liberation of Malaya, much of the time of the officers of the

Field Branch has been spent on investigational work, and to some extent this has taken precedence over extension. This has been necessary in the first place because of an acute shortage of senior staff, and secondly because investigations must come first, as all sound extension and advisory work should be based on the results of investigations.

1.—CROPS.

(A).—*Rubber*.

(i) 'SMALLHOLDERS' ADVISORY SERVICE.

378. This advisory service is a branch of the Rubber Research Institute of Malaya, and it is responsible for all advisory work among rubber smallholders. It employs a technical field staff of Instructors assisted by Demonstrators who are stationed throughout the country under the immediate supervision of the State or Settlement Agricultural Officers. Their duties embrace all routine advisory work on planting methods, disease control, manuring, the use of approved planting material, and the processing of rubber for sale. This is specialised work on one crop and the staff of the Smallholders' Advisory Service of the Institute are fortunate in having a mass of factual information based on investigations on which to advise smallholders.

(ii) SUPPLY OF APPROVED PLANTING MATERIAL.

379. The operations of the Colonial Development and Welfare Scheme No. 1176 has been mentioned elsewhere. Under this scheme the Department, in co-operation with the Rubber Research Institute of Malaya, has undertaken to supply approved planting material at subsidised prices. During the years 1950 and 1951 the following quantities of planting material were distributed:

	1950.	1951.
(a) Budwood	37,176 yards	39,489 yards
(b) Clonal seedlings	1,123,278	1,575,797
(c) Germinated Clonal Seeds ..	192,518	1,131,093

380. Under the Scheme, funds were provided to give a course of technical training to village youths at the Rubber Research Institute's Experimental Station at Sungei Buloh in Selangor. During the year, 37 young men received a full course, and another group of 40 commenced a new course in January, 1952. The purpose of the scheme is to provide an elementary training in planting methods, budding, factory technique, fertilisers, etc., and to return the men to their communities in the hope that their training will be of use to those communities.

381. Clonal seedling nurseries have not been easy to establish and maintain. In the first place, labour has been difficult to obtain and, secondly, there is a shortage of suitable land on the Department and Institute Stations. This shortage of land is becoming increasingly acute since the same land—even with manuring—cannot be used indefinitely for raising successive crops of rubber seedlings. Finally, the costs involved in running these nurseries and in the transport of seedlings to the areas where they are required are high. In co-operation with the R.R.I., schemes were initiated in 1951

whereby *kampongs* were encouraged to organise their own nurseries. Germinated clonal seed, which is easy to transport, is sent to these *kampongs* and the smallholders themselves provide land for the nursery, fencing and maintenance. The seedlings are then close at hand for planting out into the field. The success of these *kampung* nurseries has been correlated with the amount of supervision that could be given them by R.R.I. and Departmental staff. Where supervision was inadequate, many of the nurseries suffered from neglect and yielded poor seedlings. Nevertheless, the scheme is generally working well, as is shown by the figures for germinated clonal seed supplied to these *kampung* nurseries in 1950 and 1951.

(B).—*Padi*.

382. Padi Experiment Stations function as demonstration and seed production centres in addition to being centres for selection and agronomic investigations.

383. Practically the whole of the pre-war work on improved strains was lost during the war and it was necessary to start from the beginning again in 1946. The selection and testing of a new strain takes at least seven years; the results of the most advanced work now in progress cannot be fully ready for extension purposes until 1953. Nevertheless, there are some standard varieties which are in demand and, as they are kept in production on multiplication plots, seed is available for distribution. During 1951, 15,656 gantangs of seed were supplied to farmers for planting.

384. Manuring experiments carried out in Kelantan since the war have given significant responses on both wet and dry padi. In 1951, it was decided to lay down 300 simple manurial trials throughout the State in co-operation with selected padi planters. This has the object of checking results of more complex experiments in progress on Experimental Stations over a much wider range of soil and water conditions; it also allows smallholders the opportunity of trying out, on their own land, manures which have given great promise of substantially increasing the yields obtained from both wet and dry padi. From the results of these trial-cum-demonstration plots and the Department's experiments on Agricultural Stations, it should be possible for interim recommendations regarding the manuring of padi land in Kelantan to be made in time for action to be taken before the start of the 1952-53 padi season.

385. Cultivation experiments in Kelantan, carried out to test deep mechanical cultivation against the shallower hand cultivation or ox ploughing, gave significant responses in favour of deep cultivation on dry padi lands. Increases in yield of up to 100 per cent. were obtained. This has led to the Rural and Industrial Development Authority sponsoring a small pilot scheme providing two tractors and equipment for hire to the farmers of Kelantan.

386. In Selangor, demonstration work carried out by the Department on off-season cultivation of padi lands in 1950, also led to the Rural and Industrial Development Authority sponsoring a mechanical cultivation scheme. The climate and soils of

Selangor in the coastal padi area are more favourable for off-season cultivation than most parts of Malaya, and the immediate attraction of mechanical cultivation is the prospect of high profits from off-season cash crops. There are indications, however, that the subsequent padi crop will be increased.

(C).—Fruits.

387. An important function of the State and Settlement Agricultural Stations is the production of budded fruit trees for sale. Rambutans and durians are the most popular local fruits, and for many years the officers of the Field Branch have tracked down individual trees of high repute. The final selections are given a number and are established in budwood nurseries. The work on rambutans has been particularly successful and the demand for budded trees exceeds supplies.

388. During 1951, 13,331 budded fruit trees were sold. Nurseries have been expanded in 1951 to increase appreciably the supply of budded fruit trees.

2.—MECHANICAL CULTIVATION.

389. Mention has been made of the pilot schemes for introducing mechanical cultivation into the padi areas of Kelantan and Selangor. During the year there have been advances in all States and Settlements. It is now clear that Malaya is well started on a programme to introduce mechanical cultivation into smallholding agriculture over a very wide range of conditions. The first exploratory work was done by the Department and there are now schemes sponsored by Government for the Chinese new villages and by the Rural and Industrial Development Authority for general mixed agriculture in the padi fields and dry lands.

3.—LIVESTOCK.

(A).—Pigs.

390. Before the war, the Middle White pig was selected as the breed most suitable for upgrading the local Chinese breed. A central stud farm was sited at the Cameron Highlands Agricultural Station, and from there stock was provided for the State and Settlement stud centres. The focal points for pig extension work since the war have been in Penang and Province Wellesley, and Malacca. The resettlement of Chinese squatters now offers new opportunities for extending this work and new centres have been established or are in progress of being established. During 1951, the following numbers of breeding stock were sold:

Penang and Province Wellesley	...	...	50
Malacca	...	...	5
Cameron Highlands	...	...	77

391. The Middle White cross is becoming increasingly popular, and there are now examples of Chinese pig farmers keeping their own pure bred stock and stud boars. The Settlement Agricultural Officer, Malacca, reports that out of 152 Chinese sows served at the studfarm, 1,537 piglings were farrowed and were surviving at three weeks of age, an average of 10.11 per litter.

(B).—Poultry.

392. The Rhode Island Red is the principal breed kept at Agricultural Stations. During 1951, 1,602 head of poultry and 5,236 hatching eggs were sold.

4.—PESTS.

393. Rats, bandicoots, squirrels and wild pig are serious pests in Malaya, and continual vigilance is required to keep them under control. Field rats and bandicoots can be most destructive in padi, but the bandicoot is found only in the northern parts of the Federation. All State and Settlement Agricultural Officers are actively concerned with the control of these pests, and in some areas a special rat destruction staff is employed. Poison baiting, fumigation, digging, trapping and hunting are all used for the control of rats in the padi areas and, as rats are the major pest, figures are available from some States and Settlements which illustrate the extent of the operations and the degree of success.

394. In Kedah and Perlis in 1951, 620,000 poison baits were set and 385,000 were taken. The known kills were 135,000 rats and 25,000 bandicoots. In addition, 3,000 wild pigs and 15,000 squirrels were killed. In Malacca the known kills were 39,900 rats, 104 wild pigs and 5,430 squirrels.

5.—RESETTLEMENT.

395. In 1950, one Senior Officer of the Field Branch was released to assist in the resettlement of squatters, and during the early part of 1951 two additional senior officers were seconded for this work; these officers returned to the Department later in 1951.

396. In those States or Settlements where the Briggs Plan called for top priority in moving squatters into new villages, security and speed were the main considerations in selecting the sites for these new villages. Thus the State Agricultural Officer, Johore, had little part to play in advising on the agricultural requirements of new villages in so far as the type and extent of farm land were concerned.

397. Towards the end of the period under review, officers of the Field Branch became closely associated with the development of agriculture in and around the new villages. Most of the junior staff of the Field Branch are Malays, and there has been great difficulty in providing the requisite number of Chinese agricultural staff.

6.—GENERAL.

398. State and Settlement Agricultural Officers are the advisers of their Governments on all agricultural matters. They are the authorities in the various States and Settlements from whom both estates and smallholders are expected to obtain information on such matters. They are guided in their advisory work by the broad lines of policy, laid down by the Director, which govern the work of the Department. The Chief Field Officer is the co-ordinating head of the Branch and the liaison

between it and the Deputy Director. He is in close touch with the work of the various divisions of the Research Branch and this enables him to maintain a similar liaison in research and investigation matters and to pass information to State and Settlement Agricultural Officers on the progress of the work of the Research Branch.

399. Many enquiries on a wide range of subjects are received and dealt with annually by State and Settlement Agricultural Officers. These emanate both from various Government sources and from the agricultural public.

400. Advisory visits to smallholding areas are made regularly by the Agricultural Assistants in charge of districts and also by the senior staff. With the increased number of experiments carried out in co-operation with estates, and the increased inclination on the part of estates to plant crops other than rubber, e.g., oil palms, advisory visits to the larger agricultural properties have increased.

401. Lectures on agricultural subjects and demonstrations of agricultural methods have been given, from time to time, by officers of the Branch. Visits of groups of cultivators to Departmental Stations or to other States and Settlements to see work in progress or developments of interest have been arranged.

E. AGRICULTURAL EDUCATION.

402. The number of successful candidates for the 15 Diploma Scholarships offered by Government each year fell from five in 1950 to four in 1951. Even more unsatisfactory was the fact that these successful candidates included only one Malay in each of the two years.

403. The rapid expansion of all Government Departments, particularly that of the Police, has created a demand for boys with grade I or II School Certificate far in excess of the annual output from the schools.

404. During 1951, the inflow of students to the Diploma Course was broadened to include those granted Scholarships by the Rubber Research Institute, selected agricultural subordinates and assistant Rural Development officers. There were no private students.

405. Although the College is organised to take up to a total of 25 students each year for the Diploma Course, only 10 and 14 started that course in 1950 and 1951 respectively.

406. The one year Minor Course, organised essentially for Agricultural Subordinates, *Penghulus* and teachers in vernacular schools, was attended by 40 students in 1950 and 32 in 1951.

407. In common with other Branches of the Department, the College has suffered from acute shortage of staff. In spite of this, additional short courses were given during the vacation periods to Rural and Industrial Development Authority junior officers.

1.—ADVISORY COUNCIL.

408. There were no changes in the membership of the Advisory Council during the period under review.

2.—COLLEGE YEAR.

409. The year was divided into three terms, as under:

3rd term, 1950/51, session—9th January to 17th April.

1st term, 1951/52, session—6th June to 30th August.

2nd term, 1951/52, session—1st October to 18th December.

3.—REGISTER OF STUDENTS.

410. The categories of students in training were composed as follows:

REGISTER OF STUDENTS, JUNE, 1951.

(Figures in brackets refer to 1950.)

Category.	Malays.	Indians.	Chinese.	Others.	Total.
DIPLOMA COURSE.					
THIRD YEAR STUDENTS.					
Federal Scholars	(3) 2	(—) 1	(5) 10	(—) —	(8) 13
Singapore Scholar	(—) —	(—) —	(1) 1	(—) —	(1) 1
Borneo Student in Training	(—) —	(—) —	(1) —	(—) —	(1) —
Sarawak Student in Training	(—) —	(—) —	(1) —	(—) —	(1) —
	(3) 2	(—) 1	(5) 11	(—) —	(11) 14
SECOND YEAR STUDENTS.					
Federal Scholars	(2) 1	(1) —	(10) 4	(—) —	(13) 5
Private Students, Federal ..	(—) —	(—) —	(1) 2	(—) —	(1) 2
	(2) 1	(1) —	(11) 6	(—) —	(14) 7
FIRST YEAR STUDENTS.					
Federal Scholars	(1) 1	(—) —	(4) 3	(—) —	(5) 4
Agricultural Subordinate					
Major Scholars	(—) 3	(—) —	(—) 1	(—) —	(—) 4
Private Students, Federal ..	(—) —	(—) —	(3) —	(—) —	(3) —
Private Students, Singapore	(—) —	(—) —	(1) —	(—) —	(1) —
Private Students, Borneo ..	(—) —	(—) —	(1) —	(—) —	(1) —
Rubber Research Institute					
Students in training	(—) 1	(—) —	(—) —	(—) —	(—) 1
* Assistant Rural Development Officers in training ..	(—) 5	(—) —	(—) —	(—) —	(—) 5
	(1) 10	(—) —	(9) 4	(—) —	(10) 14
MINOR COURSE STUDENTS.					
Agricultural Subordinate					
Probationers in training, Research Branch, Federal	(11) 2	(—) —	(—) —	(—) —	(11) 2
Malay Agricultural Subordinates, Kedah	(3) —	(—) —	(—) —	(—) —	(3) —
Private Students, Federal ..	2	—	—	—	2
Penghulus/Asst. Penghulus	(18) 20	(—) —	(—) —	(—) —	(18) 20
Malay Vernacular School					
Teachers, Federal	(7) 6	(—) —	(—) —	(—) —	(7) 6
Brunei Students in training	(1) 2	(—) —	(—) —	(—) —	(1) 2
	(40) 32	(—) —	(—) —	(—) —	(40) 32
GRAND TOTAL ..	(46) 45	(1) 1	(28) 21	(—) —	(75) 67

* Admitted as from the 2nd term, 1951/52, session.

411. In 1951, one Federal Scholar (Chinese) of the first year Diploma Course resigned his scholarship during the first term to accept a proffered scholarship at the Technical College, Kuala Lumpur; one Malay Vernacular School Teacher was withdrawn by the Senior Inspector of Schools, Perak, during the first term as a result of being involved in a motor cycle accident in Ipoh. One Assistant *Penghulu* withdrew from the College at the end of the second term at the request of the State Secretary, Perak.

412. For the first time, four Agricultural Subordinates were selected to attend the Diploma Course with a view to qualifying for promotion to the grade of Agricultural Assistant.

413. In accordance with the new Schemes of Service, two Agricultural Subordinate Probationers were admitted to the Minor Course. The successful completion of this course is equivalent to passing the First Departmental Examination. As a result of this, the minor scholarships were discontinued.

4.—TRAINING.

414. The training in both the Diploma Course and the Minor Course followed the same general lines as before. The restitution of the third year to the Diploma Course is giving the opportunity of amplifying and balancing the curriculum to the requirements of our present standard of training, a most important aspect of which is that more time can now be given to laying a firmer foundation in the basic sciences.

415. Much of the practical field work was carried out on the adjacent Federal Experiment Station, with the active co-operation of the officers staffing the Station. This is continuing to provide a valuable part of the training.

416. Instructional visits were arranged to as many places as possible, and included—

R.R.I. Experiment Station, Sungei Buloh.

R.R.I. Laboratories, Kuala Lumpur.

Headquarters Laboratories, etc., Kuala Lumpur.

Cheras Agricultural Station.

Cameron Highlands.

Perak—Padi areas.

Kuala Bernam Coconut Estate, Bagan Datoh.

Government Rice Mill, Teluk Anson.

Klang and Kuala Langat Districts—Industrial areas.

5.—HEALTH AND RECREATION.

417. The health of the students and labour force was good. There were no cases of serious illness apart from one student suffering from appendicitis in 1950.

418. The emergency and curfew have severely restricted many of the previous recreational pursuits. The Students' Union plays a useful part in promoting recreational activities, the "after curfew" interests being especially welcome.

6.—CATERING.

419. This has remained a staff responsibility. Prices continue to rise, and more shortages occur than previously, possibly due to the large resettlement programme which was undertaken in the neighbouring villages from which supplies were heretofore obtained.

7.—REVENUE AND EXPENDITURE.

420. The cost of maintaining the College in 1951 was \$132,549.14 accounted for as follows:

(i) Staff Emoluments :	\$	c.	\$	c.
Salaries	44,916	66		
Expatriation Pay	2,798	23		
Cost of Living Allowance	26,170	56		
			73,885	45
(ii) Other Charges, Annually Recurrent			56,918	05
(iii) Other Charges, Special Expenditure			1,745	64

421. Revenue amounted to \$8,241.74 of which \$5,216.68 was derived from tuition fees, \$1,710.79 from sale of rubber, \$50.87 from sale of poultry and eggs, and \$1,263.40 from rent on Government quarters.

8.—OLD BOYS' ASSOCIATION.

422. This is very active and is growing in importance. The membership figures were as follows:

REGISTER OF OLD BOYS IN 1951 BY OCCUPATIONAL STATUS.

	Minor Course Students.	Diploma Course Students.	Total.
Departments of Agriculture ..	126*	77†	203
Other Government Departments ..	39	32	71
Rubber Research Institute ..	3	51	54
<i>Penghulus</i> /Asst. <i>Penghulus</i> ..	65	—	65
Salaried Employees, Estates ..	3	22	25
Salaried Employees, Commercial ..	4	20	24
Private Enterprise, Agricultural ..	32	6	38
Private Enterprise, Non-agricultural	3	5	8
Total Employed ..	275	213	488
Total Died ..	8	9	17
Total Untraced ..	60	28	88
GRAND TOTAL ..	343	250	593

BY NATIONALITY.

	Malays.	Chinese.	Indians.	Others.	Total.
Diploma Course ..	101	114	26	9	250
One Year Course ..	325	12	—	6	343
Total ..	426	126	26	15	593

* Includes 2 in North Borneo, 10 in Brunei, and 3 in Sarawak.

† Includes 2 in North Borneo, 3 in Brunei, and 10 in Sarawak.

F. PUBLICATIONS AND LIBRARY.

1.—PUBLICATIONS.

423. The principal publications of the Department are *The Malayan Agricultural Journal*; Special Bulletins (General, Scientific, and Economic Series); three vernacular agricultural journals, i.e., *Warta Perusaha-an Tanah*, *Ma Loy Chow Nung Nyip Tsung Poh* and *The Tamil Agricultural Journal*; and Agricultural Leaflets.

424. The Agricultural Economist, who is the Editor of *The Malayan Agricultural Journal* and also of the three vernacular journals, has the advice and guidance of the Publications Committee of the Department, of which he is a Member and Secretary, and of the Sub-Committee for Vernacular Publications of which he is Chairman.

425. Owing to printing and other difficulties no issues of the vernacular journals have been published since 1949.

426. Publication of the *Malayan Agricultural Journal* was continued on a quarterly basis but it was not found possible to print all numbers on time.

427. A new quarterly report was introduced in the Journal in 1950, entitled "Notes on Extension Work". This report reviews work done by officers of the Field Branch.

428. The 1948 and 1949 issues of the Special Bulletin "Malayan Agricultural Statistics" were issued in 1950 and 1951 and the Bulletin "Fodders and Feeding Stuffs in Malaya" was issued in 1951.

429. The following leaflets have been issued:

Budgrafting Fruit Trees (A reprint).
Coconut Leaf Moth.
Ramie.

430. Articles for a Special Mechanisation Bulletin were received in 1950 and 1951 but due to printing difficulties this Bulletin has not yet been issued.

431. The following is a summary of the number of copies of the *Malayan Agricultural Journal* sold or issued free during 1950 and 1951:

				Sales.		Free and Exchange.		Total.
Vol. 33, No. 1	..	..	..	511	..	795	..	1,306
No. 2	..	..	..	500	..	826	..	1,326
No. 3	..	..	..	524	..	803	..	1,327
No. 4	..	..	..	449	..	849	..	1,298
Vol. 34, No. 1	..	..	..	474	..	844	..	1,318
No. 2	..	..	..	468	..	824	..	1,292
No. 3	..	..	..	460	..	823	..	1,283
No. 4	..	..	..	Not issued until 1952.				

432. The following is a summary of the number of back numbers of the various publications of the Department distributed during 1950 and 1951:

	Sales.	Free and Exchange.	Total.
Malayan Agricultural Journal ..	1,502 ..	1,514 ..	3,016
Special Bulletins	190 ..	155 ..	345
Agricultural Leaflets	54 ..	2,561 ..	2,615
Poultry Leaflets	53 ..	158 ..	211
Grow More Food and Educational Leaflets	17 ..	2,642 ..	2,659
Malay Agricultural Journal ..	25 ..	246 ..	271
Leaflets in Malay	— ..	5,889 ..	5,889
Chinese Agricultural Journal ..	— ..	286 ..	286
Leaflets in Chinese	— ..	369 ..	369
Tamil Agricultural Journal ..	— ..	397 ..	397
Leaflets in Tamil	— ..	146 ..	146

433. Comparative figures for revenue received during 1950 and 1951 from the sale of publications and advertisements are as follows:

	1950.	1951.
	\$ c.	\$ c.
Sale of publications ..	3,634 86 ..	4,191 03
Advertisements ..	2,234 21 ..	2,032 00
Total ..	5,869 07 ..	6,223 03

2.—LIBRARY.

434. The Library contains about 3,280 books and reports published in book form and nearly 27,800 bound volumes of periodicals. There are approximately 1,000 unbound volumes of periodicals which are of earlier years and incomplete. Approximately 1,300 periodicals are available.

435. Over 150 periodicals and all annual reports are circulated to members of the staff as they are received.

G. SCHEMES SPONSORED UNDER THE COLONIAL DEVELOPMENT AND WELFARE ACT (U.K.).

436. Brief particulars are given here of development schemes in progress under the control of the Department of Agriculture, Federation of Malaya.

437. *Schemes D. 698, 698A and 698B*—These schemes are for the purpose of appointing an Adviser to the Malayan Pineapple Industry for the immediate administration of the rehabilitation, re-organization and development of the industry. The grants approved under these schemes were £1,320 (\$11,314.27), £5,600 (\$48,000), and £500 (\$4,285.71) respectively to meet the salaries, office expenses and passages of the Adviser, appointed at first for one year from 20th December, 1946, then extended to two years and further extended to cover his period of leave up to the 30th April, 1950.

438. It was considered necessary to retain the services of the Adviser for a further period of three years and the Central Board of Pineapple Packers, Malaya, have agreed to contribute

half the expenses for this period, the other half to be met from a further grant obtained from Colonial Development and Welfare Funds.

439. *Scheme D. 669.*—A grant of £38,000 (\$325,714) was made in June, 1946, for conducting experiments on mechanisation of wet padi cultivation in Malaya.

440. The grant was specifically for meeting capital expenditure on machinery and to meet expenses in connection with the appointment of an agricultural mechanisation expert for about two years and the cost of publication of the results of mechanisation experiments in Malaya. This scheme can be considered almost completed except for liabilities on the Crown Agents for the Colonies for equipment ordered but not yet received in Malaya.

441. *Scheme D. 1176.*—A grant of £121,786 (\$1,043,875) was approved for a scheme for the provision of improved rubber planting material to smallholders and for the training of selected youths from the rural areas in all aspects of rubber cultivation so that they will form a nucleus of instructed individuals who will return to their *kampongs* after training. The scheme is designed to cover a period of five years and is administered with the co-operation of the Rubber Research Institute of Malaya. From the inception of the scheme in August, 1949, to the end of 1951 the following quantities of material were distributed to smallholders throughout Malaya—76,665 yards of rubber budwood, 2,699,075 clonal seedling stumps and 1,323,611 germinated seeds.

442. Courses in budding and other techniques connected with the cultivation and processing of rubber were instituted at the Rubber Research Institute Experiment Station, Sungei Buloh, for selected trainees from rural areas. Quarters for trainees, staff and labourers have been erected on this Station. Expenditure from August, 1949, to December, 1951, was \$614,724.54 and revenue for the same period \$162,484.88.

443. *Scheme D. 1220.*—A grant of £10,500 (\$89,930) was approved for the establishment and maintenance, for a five-year period, of an Isolation Nursery for cacao at Pulau Tekong, Singapore. This Station is intended to serve the phytosanitary needs of British South East Asian territories in their imports of selected cacao planting material. In December, 1949, the first consignment of cacao seeds was received from the Gold Coast, West Africa, and from this first consignment approximately 5,000 plants were raised and distributed to Sarawak, North Borneo and to the Federation of Malaya. During 1950 and 1951, consignments of cacao seed were received from other countries. Expenditure from this scheme to December, 1951, was \$52,623.26.

H. PUBLIC GARDENS, KUALA LUMPUR.

444. Up to the 30th June, 1950, policy for the Public Gardens, Kuala Lumpur, continued to be vested in a Public Gardens Advisory Committee, comprising 11 prominent citizens of Kuala Lumpur under the Chairmanship of the Director of Agriculture, under whose administration the Gardens were

maintained. On the 1st July, 1950, the administration of the Public Gardens was handed over by the Federal Government to the Kuala Lumpur Municipality.

445. The supervision of the Public Gardens continued during 1950 under the direction of the Personal Assistant to the Director of Agriculture, but ceased to do so in 1951. The Horticultural Assistant was seconded to the Municipality in 1951.

446. The Gardens were maintained in a most satisfactory condition. Several new varieties of various types of ornamental plants were introduced from other countries, and the stock of plants in the propagation centre was materially augmented.

447. The supervision and upkeep of the grounds of King's House and Carcosa, the responsibility of which still rests with the Director of Agriculture, continued throughout 1950 and 1951.

448. In February, 1951, at a meeting of the Selangor State Executive Council, the Ruler in Council appointed the President, Kuala Lumpur Municipality, as Chairman of the Public Gardens Advisory Committee vice the Director of Agriculture. The Secretaryship also went over to the Municipality vice the Personal Assistant to the Director of Agriculture.

SECTION V.

AGRICULTURAL LEGISLATION.

449. Legislation, as summarized below, was passed during 1950 and 1951.

1.—THE CUSTOMS-PROCLAMATION. PROHIBITION OF IMPORTS ORDER, 1946.

450. The Schedules to Open General Licences under Section 2 were amended in 1950 to define "Plants" and "Agricultural Pests" so as to show them in their various forms and developments in order that the importing public and the officials concerned might be in no doubt as to the object and scope of prohibition.

451. Legal Notifications 473 and 474 of the 1st November, 1950, refer.

452. The definitions referred to above have been further revised and unified in 1951 so as to make it clear that it does not include foodstuffs intended solely for consumption as food, other than fresh fruits and vegetables imported by air, or foodstuffs included in any other item in the Schedules.

453. Legal Notifications 209. to 211 of the 23rd April, 1951, refer.

2.—PLANT HEALTH CERTIFICATES.

454. A communique in the form of a *Gazette* Notification was issued drawing the attention of the public to the fact that planting materials exported to countries outside Malaya are required to be accompanied by health certificates complying with international phyto-sanitary requirements, and that such certificates could be obtained by arrangement with local Agricultural Officers.

455. *Gazette* Notification No. 5 of the 5th January, 1950, refers.

3.—THE PINEAPPLE INDUSTRY ORDINANCE, 1951.

456. Parallel legislation was passed in the Federation of Malaya and the Colony of Singapore which provides for the effective control and ordered development of the Pineapple Industry so as to secure for the canned product an unassailable position in world markets. The legislation also provides for the levying of a cess on the export of canned pineapples to provide funds for the benefit of the industry. Federation of Malaya Ordinance No. 36 of 1951 and Government of Singapore Ordinance No. 39 of 1951 refer.

4.—SELECTIVE CATTLE BREEDING ENACTMENT, 1950.

457. An Enactment was passed in the State of Kelantan providing for the control and improvement of the local livestock industry. Kelantan Enactment No. 6 of 1950 refers.

5.—HILL LANDS ENACTMENT, 1951.

458. An Enactment designed to restrain and prevent the use and cultivation of hill land in a manner likely to endanger health or property was passed in the State of Pahang. Unmethodical and careless clearance and cultivation of hill lands, such as those in the Cameron Highlands region, have resulted in the silting up of streams and irrigation canals and consequent inundation of lands. Opportunity was also taken to provide for the prevention of soil erosion. Pahang Enactment No. 4 of 1951 refers.

6.—EXPORT OF RUBBER PLANTING MATERIAL.

459. Exemptions were granted from the relevant provisions of the Rubber Regulation Enactment/Ordinance of the Federated Malay States, Johore and the Straits Settlements respectively, which prohibit the export of rubber planting material outside the Federation of Malaya. Under these exemptions rubber planting material may now be exported :

- (a) to the Colony of Singapore, the Colony of North Borneo, the Colony of Sarawak, the State of Brunei, the Colony and Protectorate of Nigeria, or to research institutions in the United Kingdom and Eire, upon the condition that each consignment of rubber planting material is accompanied by a permit signed by the Controller of Rubber, Malaya, and that such permit is, within one month from the date of issue thereof or within such further period as may be specified in the permit, returned to the Controller duly endorsed by the person to whom such planting material is consigned;
- (b) to any other country which in the opinion of the Controller accords or is prepared to accord reciprocal and equivalent treatment in respect of the export therefrom of planting material (whether of rubber or any other crop) to the Federation. But this exemption shall be subject to the following conditions :
 - (i) that the Controller is supplied with particulars of the quantity, type, destination and value of the rubber planting material to be exported;

(ii) that each consignment of rubber planting material so exported is accompanied by a permit signed by the Controller and that such permit is, within one month from the date of issue thereof or within such further period as may be specified in the permit, returned to the Controller duly endorsed by the person to whom such rubber planting material is consigned;

(iii) that the person to whom such rubber planting material is to be consigned has given an assurance to the satisfaction of the Controller that such rubber planting material will not be re-exported from the country to which it is exported from the Federation.

460. Legal Notifications 492 and 493 of the 1st November, 1950, refer.

7.—UNLAWFUL POSSESSION OF RUBBER AND WILFUL AND ILLEGAL DAMAGE TO OR DESTRUCTION OF RUBBER PLANTS.

461. Under the Emergency (Rubber Control) (Amendment) (No. 4) Regulations and effective from the 6th October, 1950, it has now been made a penal offence for any person to be in unlawful possession of rubber.

462. Also it shall be a penal offence for any person to destroy or damage wilfully and unlawfully any rubber plant.

463. Legal Notification 431 of the 29th September, 1950, refers.

8.—FOOD CONTROL PROCLAMATION. FOOD CONTROL (RICE MILLING) REGULATIONS, 1950.

464. New regulations governing the erection and operation of rice mills were passed which provide for the licensing of rice mills, closure of unlicensed or poorly worked mills and for the control of sale and purchase of padi.

465. Legal Notification 520 of the 30th November, 1950, refers.

9.—AGRICULTURAL PESTS ENACTMENT (CAP. 150).

466. A new ordinance intended to supersede all existing Federal, State and Settlement Enactments providing for the control of agricultural pests and diseases has been drafted and it is hoped to secure its passage early in 1952. The new draft ordinance consolidates all existing piece-meal legislation on the subject and, in addition, provides for new factors causing the spread of diseases such as the post-war increase and frequency with which Malaya is brought into contact with other countries by all means of communication, especially by air.

O. J. VOELCKER,
*Director of Agriculture,
Federation of Malaya.*

APPENDIX I.

COMPARATIVE ACREAGES OF AGRICULTURAL CROPS.

	1946 Acres.	1947 Acres.	1948 Acres.	1949 Acres.	1950 Acres.	1951 Acres.
Rubber	3,215,250	3,317,299	3,362,525	3,364,460	3,358,251	3,360,823*
Oil Palm	79,664	78,181	83,320	90,507	93,331	97,933
Coconut	†	512,086	510,824	499,610	509,289	509,306
Padi (Rice)	789,650	813,550	885,484	908,070	930,530	875,390
Total	4,084,564	4,721,116	4,842,153	4,862,647	4,891,401	4,843,457
FOODCROPS :						
Tapioca	58,711	41,807	41,693	41,341	35,461	27,411
Sweet Potato	22,483	20,363	21,619	18,922	17,091	10,843
Sago	6,385	6,556	6,693	6,738	6,224	6,467
Sugar Cane	9,261	4,541	3,297	2,346	1,989	2,055
Groundnut	1,951	2,300	1,556	1,027	1,755	1,943
Maize	2,059	1,107	1,117	806	2,583	2,997
Yam	1,066	870	836	621	1,107	1,077
Colocasia	4,342	3,627	3,711	3,354	2,892	3,072
Ragi	1,889	451	72	37	†	89
Soya Bean	238	145	186	63	†	106
Pulses	599	487	854	548	†	784
Vegetable (Market Gardens)	17,346	15,019	15,205	13,167	10,844	10,671
Total Foodcrops	125,830	97,273	96,839	88,970	79,946†	67,465
FRUITS :						
Pineapple	13,813	11,920	16,082	17,239	23,981	24,468
Banana	67,995	64,075	59,950	57,629	48,150	39,988
Cashew Nut	1,727	1,512	2,219	2,049	2,207	2,102
Specified Fruits	17,060	20,430	25,288	32,914	66,547	†
Mixed Fruits	70,693	82,997	85,348	77,264	34,940	†
Durian	†	†	†	†	†	25,270
Rambutan	†	†	†	†	†	14,779
Mangosteen	†	†	†	†	†	7,342
Citrus Fruits	†	†	†	†	†	2,064
Other Mixed Fruits	†	†	†	†	†	41,823
Other Fruits under Sole Crop	†	†	†	†	†	2,925
Total Fruits	171,288	180,934	188,887	187,095	175,825	160,761
SPICES :						
Arecanut	51,579	50,983	50,194	48,957	48,391	47,659
Chillies	2,692	3,189	3,159	2,490	2,291	2,212
Pepper	85	80	75	80	148	156
Cardamom	5	8	7	5	2	1
Ginger	1,332	1,358	1,562	1,447	1,238	976
Sisal	2,317	2,308	2,418	2,438	2,768	2,729
Nutmeg	21	53	87	70	77	80
Cloves	281	289	288	293	283	226
Turmeric	1,018	1,035	1,174	1,120	889	838
Total Spices	59,330	59,353	58,964	56,900	56,087	54,877
MISCELLANEOUS :						
Tea	8,697	9,732	9,516	9,413	8,434	8,625
Coffee	9,839	8,958	7,047	9,507	8,951	7,435
Cacao	†	†	†	†	†	531
Tobacco	3,699	4,266	1,294	1,457	408†	2,109
Derris	1,193	772	234	297	571	428
Nipah	30,115	32,074	27,238	33,438	33,559	33,472
Gambier	523	518	387	532	986	831
Kapok	1,861	1,852	1,814	1,770	1,720	1,567
Ipecacuanha	678	678	678	257	219	179
Patchouli	173	501	109	32	37	16
Citronella	32	88	33	20	12	19
Gutta Percha	5,054	5,635	5,635	5,635	3,471	5,635
Other Miscellaneous	7,564	645	508	753	657	1,213
Total Miscellaneous	69,433	65,719	54,493	63,111	59,025	62,060
TOTAL ALL CROPS	4,510,445	5,124,395	5,241,336	5,258,723	5,262,284	5,188,620

* Provisional.

† Incomplete.

‡ Not available.

APPENDIX II.

DEPARTMENT OF AGRICULTURE, FEDERATION
OF MALAYA.

STAFF LIST AS AT 31-12-51.

Director of Agriculture: O. J. Voelcker, C.B.E., M.A., A.I.C.T.A.*Deputy Director of Agriculture:* A. E. S. McIntosh, B.Sc. (Hons.), Ph. D. (*On leave*).
R. G. Heath, B.Sc. (Agr.), A.I.C.T.A. (*Acting*).*Personal Assistant to the Director:* (*Vacant*). H. F. Logan (*Acting*).*Office Assistant:* Dhian Singh.

RESEARCH BRANCH.

*Chief Research Officer :*R. G. H. Wilshaw, M.A. (Oxon.), B.Sc.,
A.I.C.T.A. (*Special Duty*).R. B. Jagoe, B.Sc. (Hons.) (*Acting*).

(I) AGRICULTURE.

*Senior Agricultural Officer (Research) :*E. F. Allen, B.A., Dip. Agr. Sci. (Camb.),
A.I.C.T.A.*Agricultural Officers :*

G. S. Keeping, B.Sc., Dip. Agr. Sci. (Camb.).

D. W. M. Haynes, B.Sc.

J. R. Milburn, B.Sc., D.T.A.

J. L. B. Hitchcock, B.Sc. (Dunelm).

Agricultural Development Officers :

E. W. Bewlay.

A. Cumming.

(II) BOTANY.

Senior Botanist :

R. B. Jagoe, B.Sc. (Hons.).

L. N. H. Larter, B.Sc. (Hons.), A.R.C.S.,
A.I.C.T.A. (*Acting*).*Botanists :*L. N. H. Larter, B.Sc. (Hons.), A.R.C.S.,
A.I.C.T.A.E. A. Rosenquist, M.A., Dip. Agr. Sci.
(Camb.).F. B. Brown, B.Sc., Dip. Agr. Sci. (Camb.).
*One vacancy.**Junior Research Officer :*

Tak bin Haji Daud

(III) CHEMISTRY.

Senior Chemist :(*Vacant*).J. K. Coulter, B.Sc., B.Agr. (*Acting*).*Chemist :**Two vacancies.**Assistant Chemist :*

K. Kanapathy, B.Sc. (Hons.).

(IV) ENTOMOLOGY.

Senior Entomologist :

H. T. Pagden, M.A., F.R.E.S.

*Entomologist :*R. J. A. W. Lever, B.Sc. (Hons.) (Dunelm),
D.I.C. (Lond.), A.I.C.T.A., F.L.S.*Junior Research Officer :*

Kamardin bin Bahar.

(V) PLANT PATHOLOGY.

*Senior Plant Pathologist :*A. Johnston, B.Sc. (Hons.), A.I.C.T.A.,
A.L.S. (*Acting*).*Plant Pathologist :*A. Johnston, B.Sc. (Hons.), A.I.C.T.A.,
A.L.S.

(VI) SOILS AND PLANT PHYSIOLOGY.

*Senior Chemist (Soils) : (Vacant).*J. K. Coulter, B.Sc., B.Agr., Dip. Agr. Sci.
(Camb.), A.R.I.C. (*Acting*).*Chemists (Soils) :*J. K. Coulter, B.Sc., B.Agr., Dip. Agr. Sci.
(Camb.), A.R.I.C.*Two vacancies.**Junior Research Officer :*

Haji Abdul Wahid bin H. Jaffar.

AGRICULTURAL EDUCATION
BRANCH.*Principal, College of Agriculture, Malaya :*

O. M. Lee, A. I. Mech. E., A.I.N.A., F.L.S.

Senior Lecturers :

Mrs. M. H. Lee, B.Sc. (Hons.).

*One vacancy.**Registrar and Bursar :*

Yap Chin Hee.

Junior Lecturers :

Mohd. Rashid bin Ahmad.

G. R. Kurup, B.A.

APPENDIX II—(cont.)

FIELD BRANCH.

Chief Field Officer :

R. G. Heath, B.Sc. (Agr.), A.I.C.T.A.

J. R. Curry, Dip. Agr. Sci. (Dunelm), N.D.A.
(Acting).*Personal Assistant to Chief Field Officer :*

H. F. Logan.

C. Ratnam, *Temporary Assistant.*KEDAH—*State Agricultural Officer (Kedah and Perlis) :*

J. Cook, B.Sc. (Hons.), A.I.C.T.A.

Agricultural Officer :

P. G. Coleman, B.A., A.I.C.T.A.

Agricultural Development Officer :

J. A. Cox.

Junior Agricultural Officer :

Mohd. Salleh bin Musa.

KELANTAN—*State Agricultural Officer :*H. K. Ashby, B.A. (Hons.), Dip. Agr. Sci.,
A.I.C.T.A.*Junior Agricultural Officer :*

Mahmud bin Haji Yaacob

TRENGGANU—*State Agricultural Officer :*H. K. Ashby, B.A. (Hons.), Dip. Agr. Sci.,
A.I.C.T.A. (Acting).*Junior Agricultural Officer :*

Jaffar bin Mampak.

PENANG AND PROVINCE WELLESLEY—

Settlement Agricultural Officer :

H. D. Matheson, B.Sc., D.T.A. (Trin.).

Junior Agricultural Officer :

Min bin Haji Ahmad.

PERAK—*State Agricultural Officer :*

H. J. Simpson, B.Sc. (Agr.), Dip. Agri. (Wye).

*Agricultural Officers :**Perak North—(Vacant).*

Ismail bin Haji Md. Salleh (Ag. J.A.O.).

Perak Central—(Vacant).

Ramly bin Haji Tahir. (Acting).

Junior Agricultural Officer :

Ramly bin Haji Tahir.

*Perak South : (Vacant).*SELANGOR—*State Agricultural Officer :*E. J. H. Berwick, M.A., Dip. Agr. Sci.
(Camb.), A.I.C.T.A.*Junior Agricultural Officer :*

Zakaria bin Abdul Rauf

PAHANG—*State Agricultural Officer :*H. M. James, M.C., Dip. Agr. (I.C.T.A.)
(Acting).*Junior Agricultural Officer :**Pahang East—*

Wan Abdul Aziz bin Ungku Haji Abdullah.

*Pahang South : (Vacant).**Cameron Highlands—Agricultural Officer :*
(Vacant).*Agricultural Development Officer :*

N. Kanagaratnam.

NEGRI SEMBILAN—*State Agricultural Officer :*P. A. Gething, M.A., Dip. Agr. Sci. (Camb.),
A.I.C.T.A.MALACCA—*Settlement Agricultural Officer :*

A. L. Barcroft, B.Sc.

JOHORE—*State Agricultural Officer :*

W. N. Scott, B.Sc. B.Agr., Ph.D., D.I.C.

*Agricultural Officers :**Johore North—J. Chattaway, B.Sc. (Acting).**Junior Agricultural Officer :*

Haji Abdul Rahman bin Mahmood.

*Johore Central—J. Chattaway, B.Sc.*ECONOMICS AND PUBLICATIONS
BRANCH.*Agricultural Economist : (Vacant).*J. R. Curry, Dip. Agr. Sci. (Dunelm), N.D.A.,
(Acting).*Assistant to Agricultural Economist :*

J. J. Holmes.

Librarian :

P. J. Verghese.

PUBLIC GARDENS.

Horticultural Officer, Penang :

H. Ritchings.

CANNING.

Canning Officer :

A. E. Billington, M.A., A.R.I.C.

Adviser, Malayan Pineapple Industry :

C. E. Courtenay, M.B.E.

